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SERIES A: AGRICULTURAL.

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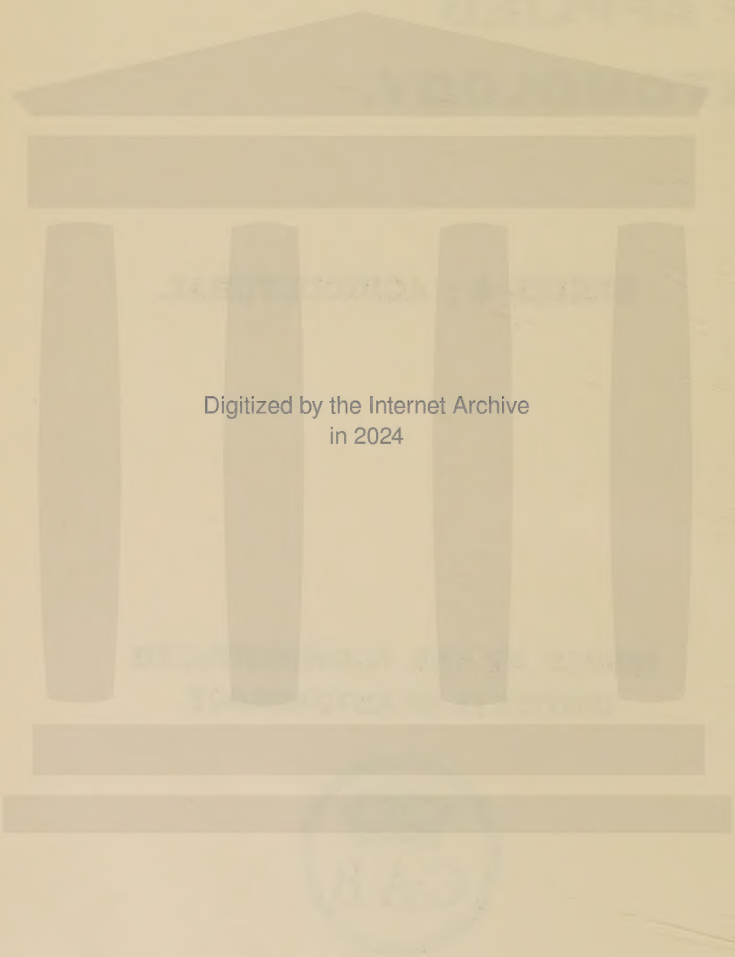

IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW
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SERIES A.

VOL. 34. 1946.

MUNGOMERY (R. W.). **Report of the Division of Entomology and Pathology.**—*44th Rep. Bur. Sug. Exp. Stas Qd* pp. 21–24. Brisbane, 1944.

The damage caused to sugar-cane in Queensland by larvae of *Dermolepida albohirtum*, Waterh., was in general less in the year ending 30th June 1944 than in the previous year [*cf. R.A.E.*, A **32** 188], although the intensity and distribution of infestation in one northern district were greater than for many years. In some districts, the dry spring and summer kept most of the beetles in the soil until late December and January, when the main flights occurred, and the beginning of soil-fumigation with carbon bisulphide was consequently delayed until the end of March. Tests with small quantities of methallyl chloride as a soil fumigant showed that under field conditions, with the same technique and dosage, this compound is more effective against larvae of *Dermolepida* than carbon bisulphide; further experiments on dosage are necessary, however, since a large dose administers a severe check to the cane and may kill the plant in dry weather. During March 1944, a Tachinid of the genus *Prosena* parasitised large numbers of the larvae in one district, and caused their almost total disappearance from some fields that had been very heavily infested a few weeks before.

Damage by larvae of *Lepidiota frenchi*, Blkb., was sporadic but locally severe. It became apparent when dry weather had checked growth and caused some loss of stools on dry soils, and this made the grub injury less obvious than in better years, but the actual damage was probably greater in the drought-stricken crops. Owing to injury by *Dermolepida* and other causes, many farmers are ploughing out and replanting, so favouring the increase of *L. frenchi* [*cf. loc. cit.*]. Losses caused by *Rhabdoscelus obscurus*, Boisd., remained low, although top rot, caused by *Phytomonas rubrilineans*, was more prevalent in the north than usual and canes affected with this disease are favoured by the weevil. It is considered that attack by the giant toad (*Bufo marinus*) and extensive pre-harvest burning have considerably reduced *R. obscurus*. It was observed breeding in *Oreodoxa regia* and *Ravenala madagascariensis*, but the comparative scarcity of such alternative food-plants indicates that they can have little or no influence on infestation in the cane-fields.

The sugar-cane areas of the far north and other coastal districts were invaded by flying swarms of *Gastrimargus musicus*, F., during the summer. In the far north, they appeared in February. The locusts fed mainly on grasses growing

along headlands and amongst stunted blocks of cane, though some damage to cane occurred in poorly-grown fields where the swarms deposited their eggs. Egg pods were first found during the second week in February, and in some egg-beds there were 128 pods per sq. ft. Many of the egg-beds covered more than an acre, and the pods contained an average of 58 eggs each. A small proportion of the eggs hatched in 18 days, but most of them apparently went into diapause. Practically no damage to cane resulted from the early hatching since the young hoppers fed almost exclusively on grasses, but in view of the possible appearance of greater numbers after the winter, experiments were carried out on the best method of destroying them. Poison baits were not effective until the second-instar hoppers first formed into bands, when a bait of 1 lb. Paris green, 50 lb. bran, 2 quarts molasses and 5 gals. water gave good results. Some growers destroyed concentrated bands of small hoppers with flame-throwers or insecticidal sprays, but these methods are too expensive for general use. Large numbers of *B. marinus* fed on the hoppers when the bands were near the banks of a creek. By the end of April, practically all the locusts had reached the adult stage and dispersed. In the Mackay district, flying swarms appeared in the cane-fields in late November, and swarms of adults and hoppers were present in most localities from then until early March. This appeared to be the worst and most extensive invasion since 1896 and occurred when growing conditions for sugar-cane were poor, so that heavy damage was caused. The wet season began in February, and the cane then recovered. From December, selected areas where eggs had been deposited were kept under observation, and some eggs were transferred to the laboratory. The parasite, *Scelio bipartitus*, Kieff., emerged from these in early March; it was plentiful in the field at the same time and could be found in appreciable numbers until June.

PEMBERTON (C. E.). **Insects carried in transpacific Airplanes. A Review of Quarantine Work prior to December 7, 1941.**—*Hawaii. Plant. Rec.* **48** no. 3 pp. 183–186. Honolulu, 1944.

From March 1936 to December 1941, all aircraft stopping at Honolulu on their way across the Pacific were inspected for insects. They were also sprayed with pyrethrum extract shortly before landing at each port and before leaving it. Quarantine stations, where aircraft were inspected, were established on Canton and Midway Islands during the period [*R.A.E.*, A **30** 99, etc.], in the course of which 301 aircraft arrived in Hawaii from Hongkong or Manila via Midway Island or from New Zealand via Canton Island, and 10,081 insects, of which 2,067 were alive, were removed at Canton, Midway or Honolulu and identified. Only 22 living insects not known previously in Hawaii were found at Honolulu. The insects taken at the three stations included *Anomala sulcatula*, Burm. [**30** 497], *Prodenia litura*, F. [**32** 246] and *Nephotettix apicalis*, Motsch., a pest of rice of which large numbers including living examples were taken in aircraft from the Philippines and Guam. This leafhopper does not occur in Hawaii or in California where the rice industry is large. During the same period, 1,367 insects, of which 137 were alive, were removed from the 321 aircraft arriving at Honolulu from California and were identified. They included living examples of *Diabrotica undecimpunctata*, Mannh. (*soror*, Lec.), a defoliator of many kinds of plants, and *Glyptina cerina*, Lec., a potato flea-beetle, neither of which occurs in Hawaii.

BIANCHI (F. A.). **The recent Introduction of Armyworm Parasites from Texas.**—*Hawaii. Plant. Rec.* **48** no. 3 pp. 203–212, 2 figs., 1 ref. Honolulu, 1944.

Of the parasites introduced from Texas into Hawaii in 1942–43 for the control of *Laphygma exempta*, Wlk., and related species [*cf. R.A.E.*, A **31** 524],

Apanteles marginiventris, Cress., and *Meteorus laphygmae*, Vier., are known to be established [*cf.* **33** 250], and others will probably be found in due course. Notes are therefore given on their life-histories and introduction.

In Texas, *A. marginiventris* has been reared from one or more species of *Prodenia*, one species of *Autographa*, *Plathypena scabra*, F., *Cirphis unipuncta*, Haw., *Heliothis armigera*, Hb., *Laphygma exigua*, Hb., and *L. frugiperda*, S. & A. In the laboratory, the adults oviposited in first-instar larvae of *L. frugiperda* soon after they had hatched and before they dispersed. Parasitised caterpillars fed normally until the fourth instar, when the mature parasite larvae left them to spin their cocoons, which were firmly attached to leaves. The period required for development from egg to adult was about ten days in summer and as much as 27 days in winter. It is considered certain that *Apanteles* will become an important factor in the control of armyworms and cutworms in Hawaii, since it is evidently adapted to Hawaiian conditions and parasitises the early instars of its hosts, which are not attacked by any of the parasites previously present there. Most recoveries were of cocoons on grasses and weeds, indicating that *L. exempta* and *L. exigua* will probably be the usual hosts, but on one occasion the parasite was reared from a larva of *H. armigera* collected in the field, and it may therefore help to reduce the damage done by this species to the maize crop.

M. laphygmae was reared in January 1944 from a larva of *L. exigua* and from one of *H. armigera* on Oahu, and in April 1944 it was found to be well established on the island of Hawaii. Since it attacks these two species, it is likely to be able to spread and reproduce during the long intervals in which the grass armyworm [*L. exempta*] is scarce in Hawaii. In Texas it has been reared from caterpillars of at least 11 species, including *C. unipuncta*, *H. armigera*, *L. exigua* and *L. frugiperda*, and was common on grasses. In the laboratory the females oviposited readily on larvae of *L. frugiperda* in the first two instars, but refused those in later ones. The development period varied from seven days at 83°F. to 14 at 69–70°, but the host had always reached the fifth instar when the parasite left it to spin its cocoon. The pupal stage varied from five days at 83°F. to 17–19 days in January, when the weather was presumably colder. The parasite can probably complete 18 generations in the year, and one female was observed to parasitise 83 caterpillars successfully in nine days.

Chelonus texanus, Cress., a solitary endoparasite that oviposits in the egg of the host and develops within the larva, is of great importance in controlling *L. frugiperda* on maize in Texas. When the host is in the fourth instar, it ceases, prematurely to feed and forms a cell, usually in soil or débris, within which the parasite completes its destruction and pupates in a tough silken cocoon. It is able to develop successfully on *H. armigera*, *L. exigua*, one or more species of *Prodenia* and *Ephestia kuehniella*, Zell. (for which the name *E. sericaria*, Scott, is used), as well as on *L. frugiperda* and *L. exempta*. The Ichneumonid, *Neopristomerus appalachianus*, Vier., is apparently not of great importance in Texas. It is a solitary endoparasite, and the author found it only in larvae of *L. exigua* infesting maize; these behaved in the same way as those attacked by *C. texanus*. *Rogas laphygmae*, Vier., is another solitary endoparasite. It was reared only from *L. frugiperda* in Texas, but readily parasitised *L. exempta* in the laboratory at Honolulu. The egg is deposited on host larvae in the first instar and the larva matures during the fourth; it pupates in a thin cocoon within the empty skin of the host. The cocoons of this species were sometimes present in maize plantings containing few or no other parasites.

In addition to the five parasites imported into Hawaii, a Bethylid of the genus *Perisierola* that appeared to give considerable control of both *L. frugiperda* and *H. armigera* was observed in Texas. It was particularly noticeable on hot still days on young maize, but was also found on full grown maize, short weeds and grasses. The adults were observed attacking the second and third instars of *L. frugiperda* and one or more early instars of *H. armigera*; they apparently

will not oviposit in the field until they have hidden the host in a safe place, probably in soil or débris. The eggs are laid externally on the host larva, and as many as five parasites developed successfully on one host ; in the laboratory the egg, larval and pupal stages lasted 24 hours, 72 hours and eight days, respectively.

WOODSIDE (A. M.). **Codling-moth Infestation at different Heights in Apple Trees.**—*Bull. Virginia agric. Exp. Sta.* no. 360, 10 pp., 1 fig., 10 refs. Blacksburg, Va., 1944.

Infestation by the codling moth [*Cydia pomonella*, L.] is usually more severe in the upper than the lower parts of apple trees, partly because the moths chiefly frequent the tops of the trees, but probably mainly owing to poor spray coverage. It was frequently observed that effective protection had not been obtained on the upper branches of apple trees in Virginia, and fruits showing no sign of having been sprayed were found in the tops of many sprayed trees. Counts were therefore made in orchards during the summers of 1942 and 1943 of injured fruits, at heights of 6, 12, 18 and 24 ft., from the inside and outside of apple trees that had been sprayed with lead arsenate, and samples of fruit from the top and bottom branches were analysed in 1942 to determine the amounts of lead and arsenic deposited on them.

Brief accounts are given of the equipment used and the sprays applied, but it is considered that differences in results in the upper and lower parts of the trees were due to uneven application, since any one tree was sprayed entirely from one tank. In 1942, the numbers of superficial injuries averaged 17·1, 25, 25·8 and 36·8 and the numbers of entries 0·5, 2·4, 7·3 and 13·9 per 100 fruits at the four heights, respectively, as compared with 0·1, 0, 0·1 and 0, and 5·4, 5·8, 11·1 and 15·7, respectively, on unsprayed trees, and in 1943 the superficial injuries averaged 79, 84·1, 83·5 and 62, and entries 1·4, 4·9, 10·7 and 8, respectively. The apparent decrease in attack at 24 ft. was due to the fact that the taller trees were the more lightly infested, and when these were considered separately the averages for them were 36, 42·2, 53 and 62 for superficial injuries and 0·2, 1, 2·2 and 8 for entries. The average deposits of lead and arsenic in grains per lb. fruit picked in August 1942 were 0·0138 and 0·0092, respectively, for the tops and 0·021 and 0·018 for the lower parts of the trees. It is concluded from the work that fair control was obtained in the lower parts but not in all cases in the tops.

In two orchards in 1943, the larvae were controlled over the whole tree by adequate spray coverage, and details are given of the treatments applied in one of these. They included only four cover sprays, but the first two contained 4 lb. lead arsenate and 1 U.S. pint nicotine sulphate per 100 U.S. gals. and special care was taken to spray the tops of the trees. It is suggested that to facilitate the spraying of the upper branches, the trees should be thinned out, young trees should not be allowed to grow too tall, and spray towers should be used wherever the land is sufficiently level.

CARTWRIGHT (W. B.) & SHANDS (R. G.). **Wheat Varieties resistant to the Hessian Fly and their Reactions to Stem and Leaf Rusts.**—*Tech. Bull. U.S. Dep. Agric.* no. 877, 6 pp., 1 ref. Washington, D.C., 1944.

The following is based on the authors' summary. About 3,000 domestic and foreign varieties and strains of wheat were tested in the greenhouse and the field at La Fayette, Indiana, in 1939–43 to ascertain which possessed sufficient resistance to the Hessian fly [*Mayetiola destructor*, Say] to be of value for commercial use or as parent material in the breeding of resistant varieties [*cf. R.A.E.*, A **30** 178, etc.]. A list is given of more than 100 varieties that showed some resistance, with figures of percentage infestation in them and in

standard resistant and susceptible varieties. Most of these varieties were also tested for resistance to stem rust [*Puccinia graminis*] and leaf rust [*P. triticina*] at Madison, Wisconsin, in 1941 and 1942, and the results of these tests are also given. Several showed a high degree of resistance to one or both of the rusts as well as to the fly.

IRREVERRE (F.) & SHARPLESS (N. E.). **The Specificity of the Xanthydrol-pyridine Reaction for 2,2 bis (p-chlorophenyl) 1,1,1 trichloroethane (DDT).** —*Science* **102** no. 2647 pp. 304–305, 1 ref. Lancaster, Pa., 1945.

The following is substantially the authors' summary. The colorimetric test for DDT (2,2-bis (parachlorphenyl)-1,1,1-trichlorethane) reported by Stiff & Castillo [*R.A.E.*, A **33** 264] was extended to 17 analogues and derivatives of DDT. The absorption maxima and extinction coefficients of the coloured reactions were also obtained. The test was not specific for DDT. Of the compounds tested, the reaction was given by those having the structure $>CHCX_3$ or $>C=CX_2$, where X=Cl or Br.

YEAGER (J. F.) & MUNSON (S. C.). **Physiological Evidence of a Site of Action of DDT in an Insect.**—*Science* **102** no. 2647 pp. 305–307. Lancaster, Pa., 1945.

An account is given of experiments in which a solution of DDT was injected into specific regions of the body and legs of the cockroach, *Periplaneta americana*, L., and its action compared with that of a solution of nicotine. It is concluded that nicotine affects the ganglia and DDT the nerves somewhere along their length. Contractions and tremors of a leg typical of DDT can result from the action of DDT at a site or sites in a nerve common to leg and body. It is strongly indicated that the site or sites consist of that region of a nerve lying between the origin of its fibres in the ventral nerve cord and the termination of its fibres in the leg, exclusive of the origin and endings (myo-neural junctions) of the fibres. These results are consistent with the idea that DDT can provoke contractions and tremors in other appendages, or in the body, by acting at a similar site on other nerves.

LÓPEZ CRISTÓBAL (U.). **Insectos útiles a la agricultura.** [Insects that are useful to Agriculture.]—*Encicl. agropec. argent.* no. 29, 7 × 5½ ins., 193 pp., 37 figs. Buenos Aires, Edit. Sudamer. S.A., 1945. Price $2.50 *m/n.*

This is a review of knowledge on insects that are predacious or parasitic on insect pests of crops in Argentina. Following a brief general discussion of parasitism and its effect on the balance of populations, separate sections are devoted to 15 Orders. The general characters and habits of these are described, the parasitic or predacious forms in them are pointed out, together with the insects that they attack, and notes are given in some cases on the bionomics of the individual species. The insects dealt with include some that have been introduced for purposes of biological control, and very brief notes are given on the results obtained with them.

SILVA (P.). **Novo registro e o primeiro hospedeiro de *Promasipoda pinguioides* T.T. (Diptera, Exoristidae) no Brasil.** [A new Record and the first known Host of *P. pinguioides* in Brazil.]—*Rev. Ent.* **15** fasc. 1–2 pp. 153–161, 3 figs., 10 refs. Rio de Janeiro, 1944. (With a Summary in English.)

Observations begun in 1938, on a plantation in Bahia, Brazil, showed that the Tineid, *Stenoma decora*, Zell., and the Saturniid, *Arsenura armida*, Cram., were potential pests of cacao there, and in 1943, females of *Promasipoda*

pinguioides, Tns., were observed in the same locality ovipositing on larvae of the latter on cacao the leaves of which were heavily infested, and on kapok (*Ceiba pentandra*) and *Rollinia longifolia*. This Tachinid was described from Amazonas in 1934, and its host or hosts had previously been unknown. The eggs, which are described, were deposited anywhere on the integument of the host, and the larvae fed internally, emerging when full-fed to pupate in the soil. In one case, in which 13 puparia obtained from a single host were kept at a temperature of 25·5°C. [77·9°F.] and a relative humidity of 75·5 per cent., the pupal stage lasted 17 days. Some males emerged in the laboratory, but none was observed in the field. Superparasitism was common, and in one case, 30 eggs were laid on one larva.

BONDAR (G.). **Notas entomológicas da Baía. XIV.**—*Rev. Ent.* **15** fasc. 1–2 pp. 191–204, 11 refs. Rio de Janeiro, 1944.

In this part of a series on insects in Bahia [*cf. R.A.E.*, A **32** 400], the author states that over 550 described species of *Conotrachelus* occur in South America, where weevils of this genus are of considerable economic importance, and that he has himself found over 50 species, most of them undescribed, in Bahia. The most harmful there are *C. phaseoli*, Mshl., on beans, *C. bondari*, Mshl., on *Annona squamosa*, *C. mamillatus*, Boh., on *Achras sapota*, *C. psidii*, Mshl., on guavas, *C. myrciariae*, Mshl., on *Myrciaria jaboticaba*, *C. licaniae*, Mshl., and probably *C. camelus*, Fiedler, on *Licania rigida* [*cf.* **31** 247], and *Conotrachelus* sp. on *Rheedia brasiliensis*. He describes ten new species of the genus, including *C. anonae* on *Annona coriacea* and *C. copaiferae* on *Copaifera langsdorfii*, both in Bahia, and *C. ubacahy* on *Eugenia edulis* in Argentina.

CARTER (G. A.) & HARDY (C. H.). **Role of the Wetter in Apple Sawfly Control.** —*Agriculture* **51** no. 12 pp. 563–566, 12 refs. London, 1945.

It is concluded from a brief review of the literature on experiments in England that *Hoplocampa testudinea*, Klug, on apple is best controlled by a nicotine spray applied about four days before the eggs hatch [*cf. R.A.E.*, A **23** 430; **25** 709, etc.], but that opinions differ as to the value of including a wetting agent in the spray. The mode of action of the nicotine is uncertain, but as first-instar larvae may be found dead after they have penetrated a short distance into calyx tissues treated with it, it is thought that it may combine with the acids in the calyx tissues to form salts and so act as a stomach poison as well as a contact insecticide. Other possibilities are that it may act solely as a contact poison on the newly-hatched larva or partly in this manner and partly as an ovicide. In any case, the egg and the plant tissues surrounding it must be well covered by the spray, and, as the egg is at the base of the stamens, the spray fluid must penetrate the narrow tube formed by them, the walls of which are waxy. To enable it to do this, the advancing contact angle, formed by the surface of the liquid and the surface over which it is flowing, must be made low by the inclusion of a wetting agent [*cf.* **24** 226]. When the advancing contact angle of a spray fluid is plotted against concentration of the wetting agent, the slope of the curve is steep at low concentrations, indicating a critical concentration for each wetting agent below which wide variations in effectiveness may occur. Experiments were accordingly carried out in 1943 in which apple trees in randomised blocks were sprayed on the correct date in May with solutions of 8 oz. nicotine with 10, 20 or 30 fl. oz. of a proprietary wetting agent, containing the sodium salts of secondary alkyl sulphates, per 100 U.S. gals. The results, based on percentages of apples attacked in each block in June–August, are analysed statistically and show that the spray containing 10 fl. oz. wetting agent was better than no treatment and inferior to the sprays containing 20 and 30 fl. oz., which were equally effective.

WEBER (A.). **Orienterende norske Forsøg med Frugttraekarbolineum som Sommersprøjtevaedske mod Bladlus.** [Preliminary Norwegian Experiments with Fruit-tree Carbolineums as Summer Sprays against Aphids.] —*Gartner-Tidende* 1943 no. 18 pp. 213–215. Copenhagen, 1943.

K. A. Karlemark reported in July 1942 that he had obtained good control of Aphids on apple in Sweden without injury to the trees by spraying with a proprietary tar-distillate emulsion (fruit-tree carbolineum) at a concentration of 2 per cent. In view of this and the current shortage of nicotine, experiments were carried out in Norway and reported by O. Husås in 1943 on the use of tar-distillate emulsions as summer sprays against Aphids on various fruit and other trees. The results were less favourable than those obtained in Sweden. Concentrations of 1 and 2 per cent. were fairly effective on apple, though less so than 3 and 4 per cent., but serious scorching was caused at the latter concentrations and some at 2 per cent. Dipping infested plum shoots in 4 per cent. tar distillate was ineffective, since the liquid did not adhere well to the Aphids, even though a spreader was included. Fruit trees appeared to be less susceptible to injury by these emulsions than other trees or bushes, and he concluded that a 1–2 per cent. emulsion could be used until nicotine again became available. In experiments in Denmark by the author, summer sprays of 2 per cent. proprietary tar-distillate emulsions of the winter and the spring types [*cf. R.A.E.*, A **31** 324] gave 80–90 per cent. mortality of Aphids on apple, but caused considerable leaf-fall. There is therefore some risk in applying these sprays in summer, and concentrations higher than 2 per cent. should not be used.

STAPEL (C.) & PETERSEN (H. I.). **Afprøvning af kemiske Bekaempelsesmidler mod Plantesygdomme og Skadedyr. I.** [Tests of chemical Control Measures against Diseases and Pests of Plants. I.]—*Tidsskr. Planteavl* **48** pp. 631–654 ; also as *Beretn. Forsøgsv. PlKult.* no. 376. Copenhagen, 1944.

Some of the experiments recorded in this report of recent work in Denmark were against insects. In experiments in which Gesarol dust containing 5 per cent. pentachlordiphenylethane [DDT] was compared in the field with Dana Derris 33 [2 per cent. rotenone], both at 18 lb. per acre, Gesarol reduced the numbers of *Meligethes aeneus*, F., on seed crops to 0·8–14 after one day and 4·7–66·3 after two, as compared with 8·5–19·9 and 12·1–54·1, respectively, for derris and 100 in the controls, and the numbers of flea-beetles (*Phyllotreta* spp.) on swedes and yellow mustard to 1–4 after one day and 0–6·6 after two, as against 1·7–5·6 and 2–7·8, respectively, for derris and 100 in the controls. When the two materials were applied at 27 lb. per acre against *Byturus urbanus*, Lind. (*tomentosus*, auct.) on raspberry, the numbers of beetles were reduced to 19·4–47 after one day and 10–84 after two by Gesarol and to 26·8–30·8 and 22·9–36, respectively, by derris, as compared with 100 in the controls. At the same rate of application, Gesarol reduced the numbers of adults of *Anthonomus rubi*, Hbst., on strawberry to 0 after one day and the numbers of injured blossoms to 55 and 79 after one and 14 days, respectively, as compared with 32, 57 and 240, respectively, on untreated plants. At 36 lb. per acre, it reduced the numbers of almost full-fed larvae of *Pieris brassicae*, L., and *P. rapae*, L., on cabbage to 7 and 20, respectively, after three days, as compared with 206 and 52 in the controls. It was much less effective against larvae of *Athalia rosae*, L. (*spinarum*, F.) on turnips, both at 18 and 36 lb. per acre, and at the higher rate gave only 5·5 per cent. mortality after one day and 4 per cent. after four, as compared with 88·5 and 96·5 per cent., respectively, for Dana Derris 10 (0·6 per cent. rotenone).

In various tests in 1942–43, proprietary preparations containing about 25 per cent. dinitro-ortho-cresol diluted to 1 per cent. and applied as dormant

sprays to apple trees proved effective against eggs of *Aphis pomi*, Deg., *Psylla mali*, Schm., and *Operophtera* (*Cheimatobia*) *brumata*, L., and larvae of Tortricids, but useless against eggs of *Paratetranychus pilosus*, C. & F.

BOVIEN (P.) & BOLWIG (N.). **Undersøgelser over Aebleviklerens Biologi i Danmark.** [Investigations on the Biology of the Codling Moth in Denmark.] —*Tidsskr. Planteavl* **49** pp. 144–157, 3 figs., 6 refs. Copenhagen, 1944. (With a Summary in English.)

An account is given of observations on the bionomics of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple in Denmark, carried out in the field in 1936–37 and 1942–43. They showed that the moth has only one generation a year [*cf. R.A.E.*, A **27** 117]. Adult emergence began at about the end of May, during full-bloom or petal-fall, and continued for a month or more. Oviposition began about 8 days after emergence, and eggs were observed throughout the flight period; in one year, they were present as late as 20th July. The larvae hatched in 8–18 days, according to temperature, and in 1942 and 1943 young larvae were still present as late as the second half of August. A spray of lead arsenate is usually applied in Denmark during the blossoming period, but as oviposition has then often only just begun, it would be more effective if applied later. Regulations forbid the application of arsenicals to apple later than 20 days after petal-fall, and even this date may in some years be too early for maximum effectiveness. The larvae wander a good deal and frequently make superficial pits in several fruits before entering one finally, and it is considered that a contact insecticide such as nicotine might be of use if applied against migrating individuals.

BOLWIG (N.). **Ørentvisten.** [The Earwig.]—*Tidsskr. Planteavl* **49** pp. 282–302, 2 pls., 8 figs., 33 refs. Copenhagen, 1944. (With a Summary in English.)

An account based partly on the literature and partly on the author's observations in Denmark is given of the bionomics of *Forficula auricularia*, L., and the habits of the adults, including the manner in which the females foster their young, are described in some detail. In Denmark, the eggs are usually laid in spring and the earwigs become full grown in August. In small-scale experiments in 1943 on control by means of poison baits, bread crumbs were preferred to fodder molasses, and Paris green, sodium fluoride and sodium fluosilicate were effective as poisons. Lead arsenate was not effective, possibly because enough of it was not eaten.

BOVIEN (P.). **Aktuelle Angreb af Skadedyr i Roemarkerne.** [The present Status of Pests of Root Crops.]—*Tidsskr. Landøkon.* 1944 repr. 15 pp., 1 graph. Copenhagen, 1944.

In this lecture to farmers, the author briefly discusses the increases that have occurred in recent years in the populations of certain insects that attack root crops in Denmark, most of which have already been recorded in annual reports [*R.A.E.*, A **33** 381, etc.]. The one dealt with in greatest detail is *Pegomyia hyoscyami*, Panz., the larvae of which mine the leaves of beet. This Anthomyiid has 3–4 generations a year and overwinters in the pupal stage in the soil. The intensity of attack has varied from year to year and has been thought by German workers to be influenced by temperature and humidity through their effect on the parasites of the fly [*cf.* **17** 599–600, etc.], infestation in a given year being favoured by low temperatures in the preceding June-August. The larvae are often heavily parasitised in Denmark by unidentified Hymenoptera, and when the average temperatures in June–August at two points were plotted against the intensity of infestation in the following seasons for the years 1918–42,

it was found that the relation between low temperatures and high infestation was fairly regular up to about 1939, but that thereafter infestation was heavy despite preceding warm seasons. Some other factor must therefore also be involved. It is considered that some indication of the likelihood of heavy infestation can be obtained by ascertaining the percentage parasitism among the overwintering pupae, which can be done during the process of washing sugar-beet. An outbreak is likely if this percentage does not exceed 50 and pupae are numerous, but unlikely if it is 90 or more.

KANGAS (E.). **Zur Biologie von *Trypophloeus alni* Lindem. (Col., Scolytidae).** [On the Biology of *T. alni*.]—*Ann. ent. fenn.* **6** no. 3 pp. 41–50, 7 figs., 4 refs. Helsinki, 1940.

The Scolytid, *Trypophloeus alni*, Lind., of which a single example had been taken in Finland in 1933, was observed breeding in *Alnus incana* at Rovaniemi in 1940. The infested tree had almost entirely dried out as a result of attack by *Dryocoetes alni*, Georg, and *Saperda scalaris*, L., and the results of an analysis of its surface in July 1940 are given and discussed. It is concluded that *T. alni* is a secondary pest. Larvae, pupae and freshly emerged adults were all present in the galleries, which occurred mainly in the phloem and seldom touched the wood, and it is thought that there is only one generation a year. A list is given of other beetles that were found in the galleries of *T. alni* and *D. alni*, some of which may have been predacious.

LOVÁSZY (P.). **Ruskean mäntypistiäisen (*Diprion sertifer* Geoffr.) loisista.** [On the Parasites of *Neodiprion sertifer*.]—*Ann. ent. fenn.* **6** no. 3 pp. 62–66, 4 figs., 1 ref. Helsinki, 1940. (With a Summary in German.)

During a recent outbreak of *Neodiprion* (*Diprion*) *sertifer*, Geoffr., on pine in southern Finland, the rate of parasitism was found to be very high. The principal parasites reared were *Exenterus abruptorius*, Thnb., and *Microcryptus basizonus*, Grav., and small numbers of *Lamachus frutetorum*, Htg., *Torocampus* (*L.*) *eques*, Htg., and *Lophyroplectus luteator*, Thnb., were also obtained. Descriptions are given of the mouth-parts of the larvae of the first three of these.

BOCZKOWSKA (M.). **Remarques sur la biologie et les dégats du doryphore aux environs d'Avignon en 1941.**—*C.R. Acad. Agric. Fr.* **30** no. 3 pp. 80–83, 2 refs. Paris, 1944.

Damage to potato by *Leptinotarsa decemlineata*, Say, is not normally severe in the district of Avignon, as early varieties are grown there and the crop is harvested in June–July, before the infestation has had time to develop. Under war-time conditions, however, later varieties have also been grown, and these have provided a succession of young plants on which populations could be built up. A heavy outbreak of larvae occurred in July 1940, and observations were therefore made on the course of the infestation in the following year; weather conditions from the severe winter of 1940–41 until September 1941 are briefly described.

At one place, the overwintered adults began to appear towards the end of February. Some remained inactive, but others attacked egg-plants [*Solanum melongena*] in frames and gave rise to larvae that fed on the leaves in late April. Throughout the rest of the area, however, the adults emerged at the end of April and began to oviposit at the beginning of May. The early potato crops were then well-grown and escaped injury, but the later ones were heavily attacked, the shoots sometimes being destroyed as soon as they appeared above the ground, so that it was necessary to remove the soil from them in

order to apply control measures. First-generation larvae hatched at the end of May, and treatments were applied against them during the first half of June. The new adults began to emerge at the beginning of July, but caused little damage. No measures were taken to control them, with the result that a second outbreak of larvae, heavier than the first, occurred at the end of the month. These defoliated the plants, but did not injure the crop, since the tubers were already fully developed. When the adults emerged in large numbers at the end of August, potato was no longer available, and they migrated to tomato, feeding on the leaves and stems. They entered the soil in September without ovipositing, although the mean temperatures were still favourable. Egg-plants were attacked throughout the season, but no serious damage was reported.

Observations on the course of the infestation on potatoes of two varieties, one planted on 8th April and the other on 23rd May, showed that oviposition by the overwintered adults was heavy, but that the subsequent larval infestation was not severe and damage was unimportant. This is attributed to the activity of predators, which attacked the eggs and young larvae, and entomogenous fungi, which killed the beetle in the soil. Oviposition by females of the overwintered and first generations reached its peak on the later variety on 27th June and on 29th July, respectively. It is recommended that potatoes planted in late March and early April should be treated twice, against the larvae and adults of the first generation, and that those planted later should receive in addition two further treatments against the larvae and adults of the second. Egg-plants under frames should be kept under observation in order to detect the presence of early-emerged adults.

RÉGNIER (R.). **La lutte contre le silphe de la betterave.**—*C.R. Acad. Agric. Fr.* **30** no. 3 pp. 86–87, 1 ref. Paris, 1944.

Silpha (*Blitophaga*) *opaca*, L., has of recent years caused considerable damage to sugar-beet in France, particularly to late plantings. In northern districts, the first injury of the year is caused in May by the overwintered adults; these oviposit in the soil in June–July. The larvae hatch in 5–6 days, feed voraciously on the leaves for about three weeks and pupate in the soil. The adults emerge in August, and also feed on beet. Control of this Silphid is generally neglected, but injury by it increases as the season advances and is frequently accompanied by attack by Cassidids. The measures recommended are hoeing to destroy wild *Chenopodium* and *Atriplex*, which are food-plants of both *S. opaca* and the Cassidids, and spraying with arsenicals as soon as the population increases dangerously. These should be applied so as to reach the lower surfaces of the leaves.

SILVESTRI (F.). **Compendio di entomologia applicata (agraria-forestale-medica-veterinaria). Parte speciale, Vol. II (fogli 1–32)** pp. 1–512, 651 figs. Portici, 1943.

The first part of this volume deals with the Neuroptera, Mecoptera, Trichoptera and Lepidoptera (in part). As in the previous volume [*cf. R.A.E.*, A **23** 296; **28** 325], descriptions are given of the characters and bionomics of typical species, chiefly those occurring in Italy, with notes on the control of some of them.

CATANEI (A.). **Nouvelles observations sur des microbes de l'intestin des sauterelles pèlerines envahissant l'Afrique du Nord.**—*Arch. Inst. Pasteur Algérie* **22** no. 3 pp. 166–170, 4 refs. Algiers, 1944.

In 1915, when an attempt was made to control *Schistocerca gregaria*, Forsk., in Algeria by means of *Coccobacillus acridiorum* from Mexico, examples of this

locust that invaded Oran were found to contain two bacteria that had the same general characters as *C. acridiorum* and apparently immunised them from the latter [*R.A.E.*, A **4** 45]. In 1917, the year after work with *C. acridiorum* was discontinued, locusts taken outside the control area showed a black diarrhoea similar to that associated with infection with *C. acridiorum* and contained a similar bacterium, but the disease it produced was neither fatal nor contagious [*cf.* **8** 41]. In 1944, an outbreak of *S. gregaria* occurred in the coastal region of Algeria, and of 1,069 apparently healthy locusts captured in or near Algiers, 49 emitted a drop of black fluid on pressure of the abdomen. Microscopic examination of the drops of fluid from these locusts revealed the presence of coccobacilli in only one, but when the drops were cultured in broth, a bacterium referred to as coccobacillus A was found to be present in 79·5 per cent.; it was associated with another coccobacillus (B) in 43·6 per cent. of the cultures, and with other bacteria in 7·7 per cent. No bacteria were present in cultures of intestinal contents that were normal in appearance.

Protection des cultures contre les acridiens par un extrait de mélia.—*Arch. Inst. Pasteur Algérie* **22** no. 3 pp. 251–254, 1 fig., 3 refs. Algiers, 1944.

In experiments by E. Sergent in Algeria in 1944 to develop a simpler method of preparing extracts of *Melia azedarach* for use as a repellent against locusts [*cf. R.A.E.*, A **25** 670; **26** 180], two stems of *Medicago arborea*, one of which had been sprinkled with an extract of the fresh leaves macerated in tap water at outside temperatures for 24 hours, were placed in a large cage containing many examples of *Schistocerca gregaria*, Forsk. (*peregrina*, Ol.). The untreated stem was defoliated in a few hours, but the treated one was not attacked during the four days of the experiment. The extract is equally effective whether prepared from fresh or dried leaves or fruit, by maceration at ordinary temperatures or at 70°C. [158°F.] or by decoction. In a field experiment in the same year, J. Arnaud used an extract prepared by steeping 5 lb. dried fruit that had been stored for seven years in 20 gals. water at a temperature of 70°C. for one hour. Vegetable crops in a kitchen garden that were sprayed with the extract were undamaged by locusts, whereas those in neighbouring gardens were completely destroyed. For maceration at ordinary temperatures, the quantities of fresh leaves and of dry leaves or fresh or dry fruit recommended per 2 gals. water are 3 and 1 lb., respectively.

Tooke (F. G. C.) & Scott (M. H.). **Wood-boring Beetles in South Africa. Preventive and remedial Measures.**—*Bull. Dep. Agric. For. S. Afr.* no. 247, 37 pp., 25 figs. Pretoria, 1944.

Wood-boring beetles became of importance in South Africa during the war, as locally grown timbers and timbers imported from tropical Africa were used to replace imports from overseas. Several of these timbers are very susceptible to attack and have proved in some cases to have been already infested when incorporated into buildings and furniture. Considerable damage has thus been caused, and information on the beetles responsible is given in this bulletin.

Green or freshly felled wood is attacked by Platypodid ambrosia beetles; they commonly occur in hardwoods imported from Central Africa, but are of little importance in South African timber. The typical life-history of species of this family is outlined, and a list of timbers susceptible to them given. To prevent infestation, logs that cannot be sawn immediately and dried rapidly [*cf. R.A.E.*, A **33** 85] should be stored in dense shade, in the open in full sun or in a log pond, and breeding material produced by milling operations or the importation of infested timber should be destroyed. Experiments with repellents have not given promising results.

Much more serious damage is caused by beetles that attack seasoned wood only. Of the Bostrychids [*cf.* **27** 60], *Heterobostrychus brunneus*, Murray, *Bostrychoplites cornutus*, Ol., *Dinoderus minutus*, F., *Sinoxylon ruficorne*, Fhs., *S. transvaalense*, Lesne, *Xylion adustus*, Fhs., and *Xyloperthodes nitidipennis*, Murray, are injurious, and of the Lyctids, *Lyctus brunneus*, Steph., is the only injurious species present. Details are given of the bionomics of *H. brunneus*, *S. ruficorne* and *Lyctus*, of the timbers susceptible to attack by all these beetles, and of methods of control and eradication. These comprise the removal of sapwood, general hygiene in woodyards and stores, sterilisation by heat [*cf.* **25** 669], and treatment with preservatives [*cf.* **33** 84], of which the most promising is a mixture of 4 per cent. pentachlorphenol, 16–20 per cent. solvent and 80–76 per cent. white spirit (mineral turpentine) as a penetrant. Any suitable solvent may be used, provided that the concentration of pentachlorphenol is maintained.

The only two Anobiids found in South Africa are the bark-feeding *Ernobius mollis*, L., which is of little importance, and *Anobium punctatum*, Deg., which is injurious to furniture throughout the world. It attacks old seasoned sapwood and heartwood of hardwoods and softwoods, and has been observed doing extensive damage in the woodwork of houses in three districts of Cape Province and one of the Orange Free State. It has apparently been present in the Union for some time. Its life-history is described, and the same measures are recommended against it as against *Lyctus*.

Hylotrupes bajulus, L., was first observed in the Union about ten years ago, when a single example emerged from a floor of a house in Claremont. Remedial measures were advised, and as no further reports were received, it was assumed that the Cerambycid had been eradicated. In 1941, however, it was found doing extensive damage in a school in Port Elizabeth, and subsequent investigations showed that it was also present there in other buildings and in out-door woodwork, including hoardings, pine fences and a grandstand. In March 1943, the roofs of two houses in Cape Town were found to be so heavily infested by it that they were in danger of collapse, and a survey showed that infestation of buildings in the southern suburbs was extremely serious. The situation is complicated there by the fact that the beetle has been found breeding in old stumps and logs in the pine forests on the slopes of Table Mountain and the Cape Flats, and even in dead branches high up on living trees and in pine slabs. It was apparent from the severity and extent of the infestation that the beetle had long been present in Cape Town, where damage due to it may have been mistaken for dry rot. It has also recently been discovered in a wooden tower on a church in Uitenhage. Its bionomics are described, partly from the European literature, and it is emphasised that it attacks only coniferous timbers and usually avoids the heartwood. The larval stage in South Africa lasts about 2–3 years out of doors and rather longer, possibly 3–6 years, indoors, and the adults emerge mostly in October–December.

H. bajulus is thought to have become a pest in Denmark owing largely to the warm conditions provided by slate roofing [**19** 379], but under the hotter conditions of South Africa infestation has been found mostly beneath tiled, thatched or shingled roofs, and only rarely beneath roofs of iron. The best conditions are therefore apparently provided there by roofs that are poor conductors of heat. The beetle requires moderate temperatures and a consistently high atmospheric humidity for development, so that it is thought that it is unlikely to spread far from the coastal belt. It is feared that eradication will prove impossible, but various preventive and control measures can be taken. Pine plantations near cities should be kept as clean as possible, untreated pine fences should not be erected in the infested areas, existing fences should be inspected, and uninfested ones should be brushed with creosote immediately and at intervals of four years and infested ones removed and burnt. Timber in buildings should be inspected and, if uninfested, thoroughly treated with the

mixture recommended against *Lyctus*. Heavily infested timber should be removed and replaced with treated wood, and any that is lightly infested should be scraped and have the infested parts cut out ; all timber should be inspected every six months for signs of further damage. Timber for replacement or for new buildings should receive the treatment recommended against *Lyctus* before use and it should be given as near the source of supply as possible against both insects.

TAYLOR (T. H. C.). *Lygus simonyi*, **Reut., as a Cotton Pest in Uganda.**—*Bull. ent. Res.* **36** pt. 2 pp. 121–148, 8 refs. London, 1945.

This detailed review of recent work on *Lygus simonyi*, Reut., in Uganda contains sections on food-plants, damage to cotton by this and other Capsids, natural enemies, the annual course of infestations in the elephant-grass and the short-grass zones, and suggested means of reducing damage. Emphasis is laid on problems that require further investigation before control measures can be formulated.

L. simonyi, like many other species of its genus, feeds principally on young rapidly growing tissues, such as buds and young stems, and attacks a great variety of plants, those on which it is known to breed representing 15 families. Infestation of cotton begins when the plants are small, and the most serious result of the attack is the shedding of flower-buds and death of the terminal buds of branches [*cf. R.A.E.*, A **24** 106–107], which are caused by both nymphs and adults. The effect of attack on plant development and yield was studied by weekly observations, the results of which are given, on 30 individual plants throughout their period of growth. The reaction of the tissues to the insertion of the stylets for feeding is discussed, with special reference to the importance of moisture as a factor that renders them susceptible to damage. An undescribed species of *Lygus* caused similar damage to the tissues of cotton in humid conditions in the laboratory, but it does not breed on cotton, and so is probably of relatively little importance in the field. Another Capsid, *Megacoelum apicale*, Reut., caused the shedding of flower-buds and terminals in the laboratory by attacking the stems of these parts, and probably does so in the field, where it also caused spotting on bolls.

The principal natural enemies of *L. simonyi* are two undescribed species of *Euphorus*, which attack the nymphs. These Braconids, which parasitise several other Capsids also, occur in both the elephant-grass and short-grass zones. In the former, they attack *L. simonyi* abundantly in cotton plots and elsewhere and attain almost total parasitism in it, though not early enough in the season to prevent severe damage ; whereas in the latter, they do not frequent cotton plots and play no part in control. It is suggested that the possibility of the existence of different races of *Euphorus* in the two zones should be explored with a view to utilising a cotton-frequenting race in the short-grass zone where the damage is more severe, and that the part played by parasites in certain areas of Africa where *L. simonyi* occurs in numbers too small to cause serious damage should be investigated, although the prospects of biological control are not considered good.

In the elephant-grass zone, the annual infestation on cotton begins by gradual infiltration of adults from scattered, wild food-plants. In the short-grass zone, it begins principally by a sudden mass invasion of adults driven by harvesting from the grain crops, *Eleusine* and sorghum, which are important food-plants, and lasts longer owing to the lack of parasitism.

Leaf texture and hairiness as factors contributing to resistance of cotton to infestation are discussed. Preliminary studies indicated that a degree of hairiness much greater than that of any variety at present available, particularly as regards length, might provide resistance, and that work on hairiness should be continued to this end. The type of branching is also an important factor,

monopodial branches being less severely damaged than sympodial, probably because monopodia begin to produce flower-buds later, their terminals are protected by the young developing sympodia that surround them and the monopodial habit provides a greater choice of buds derived from primary branches.

Consideration is also given to changing the sowing date of cotton in order to delay the production of flower-buds, and to the use of grain crops as trap-crops, as means of reducing damage.

BENSON (R. B.). **Further Note on the Classification of the Diprionidae (Hymenoptera, Symphyta).**—*Bull. ent. Res.* **36** pt. 2 pp. 163–164, 3 refs. London, 1945.

In view of the fact that the shape of the scutellum, as used in his key to the genera of the DIPRIONIDAE [*R.A.E.*, A **28** 228], has been found liable to considerable individual variation and rather difficult to interpret in members of the genus *Neodiprion*, the author makes slight rearrangements in the key. He recognises two subfamilies on the basis of other morphological differences correlated with the known differences in food-plants; these are the MONOCTENINAE, attached to Cupressaceae and comprising the genera *Monoctenus*, (on *Juniperus*) and *Augomonoctenus* (on *Libocedrus*), and the DIPRIONINAE, attached to Pinaceae and comprising *Diprion*, *Gilpinia*, *Macrodiprion*, *Microdiprion*, *Neodiprion*, *Nesodiprion*, *Prionomeion* and *Zadiprion*. He points out that *Gilpinia variegata*, Htg., which belongs to the *socia* group, was omitted from the list of species of the genus in the previous paper.

MARSHALL (Sir G. A. K.). **New injurious Curculionidae (Col.) from tropical Africa.**—*Bull. ent. Res.* **36** pt. 2 pp. 177–180. London, 1945.

The new weevils described are *Lixus latro*, which causes serious damage by boring in the stalks of cabbage in Eritrea, *Nanophyes croceus*, which feeds in the flowers of bananas, and *Baris nigritula*, which attacks cucurbits, both in Senegal, and *Heterostylus aliberti*, on *Cola*, and *Leurostethus* (gen. n.) *raphiae*, taken on the fruit and bred from the seeds of *Raphia*, both in the Ivory Coast.

GOLDING (F. D.). **Fruit-piercing Lepidoptera in Nigeria.**—*Bull. ent. Res.* **36** pt. 2 pp. 181–184, 4 refs. London, 1945.

The author records observations on fruit-piercing Noctuids in Nigeria, made mainly on a plantation at Ibadan during the seasons 1938 and 1939. Prior to 1937 it contained few mature *Citrus* trees and damage was negligible, but in most subsequent years the wet-season crop (principally tangerines, sweet oranges and grapefruit) has been badly injured, though the dry-season crop has escaped attack. A list is given of 23 Noctuids and a Satyrid observed piercing fruit, including some not recorded in lists from Sierra Leone or the Gold Coast [*cf. R.A.E.*, A **25** 254; **29** 106; **30** 505]. Nearly all the 19 species of Noctuids known to attack *Citrus* have also been observed piercing mangos. Notes are given on the attack in 1938, 1939 and 1942. One or more of the three species, *Achaea lienardi*, Boisd., *A. faber*, Holl., and *Othreis fullonia*, Cl., were of importance in each of the years from 1937 to 1942, while *A. mormoides*, Wlk., *Sphingomorpha chlorea*, Cram., and *Anonis leona*, Schaus, were moderately abundant in some of them.

Both *Achaea lienardi* and *A. faber* were often attracted to lights in large numbers. No larvae of *Achaea* were found at Ibadan in years when the adults were abundant, but larvae of *A. lienardi* were found on *Bridelia ferruginea* and *Monodora tenuifolia* and those of *A. faber* on *Celtis prantlii* in March 1939 in a Forest Reserve about 22 miles to the west, indicating that migration occurs.

Achaea was observed attacking fruits of *Eugenia uniflora*, guava and tomato as well as *Citrus* and mango, and on one occasion *A. faber* was seen piercing fruits of *Ficus anomani*. Piercing continued throughout the night and until about 10.30 a.m. on dull days. On 17th May 1938, when ripe fruits were hung in two orchards, 60 per cent. of the moths were on mango, 28 per cent. on banana and 12 per cent. on grapefruit; other experiments showed that ripe mangos were more attractive than ripe sweet oranges.

In experiments with poisoned fruits, it was found that the most effective means of killing the moths was to suspend mangos that had been soaked for an hour in an aqueous solution of 1¼ per cent. sodium arsenite; three or four segments were cut out of each fruit and a scalpel was passed through the pulp to enable the poison to penetrate. Both *Achaea* and *S. chlorea* were attracted to these baits in numbers. This method cannot be used in years when mangos are not ripe until most of the *Citrus* trees are bearing ripe fruits. When mango juice, extracted the previous year and preserved by means of potassium metabisulphite, was poisoned with 1 per cent. sodium arsenite and exposed in trays in *Citrus* orchards, few adults of *Achaea* were attracted to it. It was found that harvesting the crop promptly when fruit-piercing moths were very abundant resulted in the saving of a considerable proportion of it [*cf.* **30** 506].

TEWFIK (M.). **The Desert Locust** (*Schistocerca gregaria* **Forsk.**) **Movements in South-west Arabia** (**Orthoptera-Acridinae**).—*Bull. Soc. Fouad Ier Ent.* **28** pp. 1–43, 1 map. Cairo, 1944.

Information on the movements and breeding places of *Schistocerca gregaria*, Forsk., in Yemen and Hadhramaut obtained from the inhabitants in April–October 1936 is quoted and discussed. There are two important rainy seasons each year, in April and August, in many districts to the east and west of the Yemen plateau, which are therefore under extensive cultivation and provide favourable conditions for migrating locusts. These come from other parts of Arabia, from Iraq, and from the west across the Red Sea. The largest and most injurious invasions occur every seven years and come from Iraq, others from the west occur every three or four years, and some are the result of the breeding of the locust in Beihan, which is also invaded by swarms from the north and west. Swarms enter Hadhramaut from the north and west, generally during the winter and summer, though certain districts are not reached by the summer swarms until autumn. Swarms from the north appear every seven years, and swarms from the west, which had crossed the Red Sea or come from Beihan, were recorded in 1927, 1930 and 1935. After the invasion in 1930, the locusts persisted for two years in the northern part of the plateau and three in the southern part and the coastal region, the difference being attributed to climatic and other factors.

The author observed adults of the gregarious phase at one place in Yemen and adults of the solitary phase at two places in Yemen and two in Hadhramaut. He did not find eggs in either region, although oviposition was reported to occur at many places in both.

Notes on the climate of south-western Arabia, based on meteorological records made in 1936, are given by S. A. Huzayyin in an appendix (pp. 31–43).

HUSSEIN (M.). **Summary Report on the Work of the third Egyptian Anti-Locust Unit to Arabia.**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 155–177, 4 maps, 3 refs. Cairo, 1944.

An account is given of a campaign against *Schistocerca gregaria*, Forsk., in Hejaz, Asir and Yemen in January–June 1944, together with topographical and meteorological data, observations on the movements of the swarms and

on breeding areas, both of which are shown on maps, and details of the technique adopted for the application of poison bait. Hoppers hatched during December–March from eggs deposited at many places in the coastal region by swarms that had arrived from Africa at the end of 1943, and the adults to which they gave rise migrated to the mountainous area east of Yemen and Asir early in March ; another spring generation was produced in some areas in May. A poison bait of sodium arsenite, bran, molasses and water was used on a large scale against the hoppers with satisfactory results, and preliminary observations indicated that its attractiveness was not reduced by the omission of the molasses. Poison bait was not applied against the migrating adults, which are used as food by the inhabitants, but it gave promising results against newly-emerged ones. Of the measures employed when poison bait was not available, spraying with solar oil was effective. In late May, swarms of immature adults entering Hejaz from the east showed a high degree of parasitism by Dipterous larvae.

BODENHEIMER (F. S.). **Additions to the Coccoidea of Iraq, with Descriptions of two new Species (Hemiptera-Homoptera).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 81–84, 1 ref. Cairo, 1944.

Records are given of Coccids observed in Iraq in 1943, together with their food-plants, and two new species are described. One of the latter is *Parlatoria morrisoni*, which was observed on olive, mulberry, *Nerium oleander*, *Jasminum sambac*, *Cordia myxa*, *Melia azedarach* and cultivated rose. Other species on plants of economic importance include *Aonidiella orientalis*, Newst., and *Coccus hesperidum*, L., abundant on *Citrus* ; *Nilotaspis* (*Coccomytilus*) *halli*, Green, on peach ; *Parlatoria blanchardi*, Targ., on date palms ; *Pseudococcus citri*, Risso, on mulberry ; *Lepidosaphes ficus*, Sign. (*Mytilococcus conchiformis*, auct.), and *Ceroplastes rusci*, L., on fig ; and *Eulecanium bituberculatum*, Targ., on plum and cultivated *Crataegus*.

BODENHEIMER (F. S.). **Note on the Coccoidea of Iran, with Descriptions of new Species (Hemiptera-Homoptera).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 85–100, 8 refs. Cairo, 1944.

Records based on the literature, which is reviewed, and on the author's own observations in 1943 are given of the distribution and food-plants of 62 species of Coccids from Persia, including four new ones, which are described, and the zoogeographical affinities of the country are discussed with reference to its Coccid fauna. The species on plants of economic importance include *Icerya purchasi*, Mask., on *Citrus*, hemp (*Cannabis sativa*) and camphor (*Cinnamomum camphora*) ; *Pulvinaria floccifera*, Westw., *Aonidiella aurantii*, Mask., *A. orientalis*, Newst., *Lepidosaphes* (*Mytilococcus*) *beckii*, Newm., *L.* (*M.*) *gloveri*, Pack., *Coccus hesperidum*, L., and *Parlatoria ziziphus*, Lucas, on *Citrus* ; *P. morrisoni*, Bodenh. [*cf.* preceding abstract] on *Citrus* and *Zizyphus* ; *Chrysomphalus dictyospermi*, Morg., on *Citrus* and apricot ; *Pulvinaria betulae*, L., on apricot ; *Quadraspidiotus ostreaeformis*, Curt., and *Lepidosaphes* (*Mytilococcus*) *ulmi*, L., on apple ; *Eulecanium bituberculatum*, Targ., on pear and plum ; *Chionaspis asiatica*, Arkh., on plum ; *Parlatoria oleae*, Colv., on olive and plum ; *Phenacaspis prunorum*, Borkh., on quince, plum and apricot ; *Pulvinaria pistaciae*, Bodenh., and *L.* (*M.*) *pistaciae*, Arkh., on *Pistacia vera* ; *Pseudococcus citri*, Risso, on pomegranate and grape-vine ; *Phoenicococcus marlatti*, Ckll., and *Asterolecanium phoenicis*, Green, on date palm ; an undetermined species of *Margarodes* on wheat ; and *Filippia gossypii*, sp. n., which occurs on cotton, but is apparently not injurious.

RIVNAY (E.). **A Contribution to our Knowledge of *Phyllopertha* (*Blitopertha*) *nazarena* Mars., a Wheat Pest in Palestine (Coleoptera : Scarabaeidae-Rutilinae).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 101–108, 2 figs. Cairo, 1944.

Anomala (*Phyllopertha*) *nazarena*, Mars., which was described from Palestine in 1878, was not observed to cause any damage there until 1936, when patches of wheat in fields in the Esdraelon Valley were killed by the larvae. Descriptions are given of the egg, larva and adults of this Rutelid, together with an account of observations on its bionomics. The larvae feed on the roots of young wheat, causing the plants to dry up in late December or January, when they are 4–6 ins. high. Each larva attacks several plants, and the fusion of infested patches may result in destruction of the wheat over large areas. In large fields, bare patches may not be found, but the plants may be so thinned that weeds become established and render harvesting difficult. When infestation is heavy, yields may be reduced by as much as 75 per cent.

Eggs did not hatch in the laboratory, but are assumed to hatch in the field after the rainy season has begun, as newly hatched larvae as well as older ones were present in winter. The larvae fed by night on the roots of young plants during three successive rainy seasons, aestivating in earthen cells at a depth of about 16 ins. after the first two and pupating at or below this level after the third. The pupal stage lasted 10 days in the laboratory, but the adults remain in the pupal cells for several days after emergence and did not appear in the field until about the middle of May. They survived for only 15–20 days, so that oviposition is thought to occur in June. Adults were present in the field from mid-May until late June and were active at temperatures of 23–29°C. [73·4–84·2°F.], but all except one of several hundred collected were males. Females were as common as males in the laboratory, but they are rarely encountered in the field as they shelter in crevices. The adults did not feed and were not attracted to sweetened baits containing various volatile oils. They occur on clay soil in which wide deep cracks develop, pair in these cracks, and probably deposit eggs in them at depths at which fluctuations in atmospheric humidity are not felt. The larvae are susceptible to changes in the humidity of the soil, and of those reared in the laboratory, several died when conditions became unfavourable while they were in diapause.

In the Esdraelon Valley, infestation chiefly occurs on hills where the soil is well drained and aerated ; larvae were not found in neighbouring districts on similar, but undrained, soil, and sandy soils are unfavourable. Infestation was also reported from slopes near the coast. In experiments on control, naphthalene flakes, paradichlorbenzene and calcium cyanamide were applied at rates of about 88, 66 and 110 lb. per 1,000 sq. yds., respectively. The calcium cyanamide was ineffective, the paradichlorbenzene killed 50 per cent. of the larvae, and the naphthalene killed 90 per cent., but these treatments would be too costly for general use.

ELZE (D. L.). **Observations on *Brachycolus brassicae* L. in Palestine (Hemiptera : Aphidoidea).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 109–112, 3 refs. Cairo, 1944.

A study of the life-cycle of *Brevicoryne* (*Brachycolus*) *brassicae*, L., on cabbage was made in Palestine from November 1935 to July 1936. The initial stock consisted of five females collected when almost fully-grown, and two series of generations were bred, one from the first offspring in each generation and the other from the last. Some of the results obtained are shown in tables. The average duration of development varied from 10 to 13 days, and individual development from six days in summer to 21 in winter. The average life of the adult viviparae varied from 17 to 26 days, and they produced about 30

progeny; some continued to produce young for over a month. Nearly all the Aphids were apterous viviparae, and only seven alates appeared during May–July, when this form was common in the field. Sexuales were never observed in the field, but one or more appeared in all the experimental series in January April, and pairing and oviposition occurred in one instance. The conditions of rearing differed from those in nature in that the light intensity was low, which might explain the production of sexuales [*cf. R.A.E.*, A **19** 557], and the plants were succulent and protected from dry winds, which may have reduced the production of alate viviparae.

EL-ZOHEIRY (M. S.). **The Violet Leaf-rolling Gall Midge, *Dasyneura* (*Perrisia*) *affinis* Kieffer, in Egypt (Diptera : Cecidomyidae).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 113–118, 7 figs., 11 refs. Cairo, 1944.

Violets (*Viola odorata*) are widely grown in Egypt, but *Dasyneura affinis*, Kieff., was not recorded from them until June 1937, when it was found near Cairo. It was again observed in November 1941 [*cf.* next abstract], and in a survey in 1942–43 was present in a number of districts near Cairo and at Assiut. All stages of this Cecidomyiid are described. The eggs are laid within the tissue of the outer leaves along the edges near the petiole, and the leaf-edges roll upwards and become thicker, paler in colour, and partially woody, thus forming galls in which the larvae develop gregariously. Pupation occurs within cocoons inside the gall, which develops as the larvae grow and is fully formed in about 50 days. When the adults are ready to emerge, the gall becomes darker and partly unrolls, and the leaf falls. There are several generations a year, and emergence occurs throughout the spring, summer and autumn. Infested leaves were found in every month of the year except August and December.

In view of the inaccessibility of the larvae and pupae to insecticides, the destruction of infested leaves is recommended as a control measure. In experiments by N. Mohamed and M. Zaki, plants sprayed in early spring with lime-sulphur, 1 per cent. summer oil alone or with 0·1 per cent. nicotine sulphate, or 0·2 per cent. nicotine sulphate with 0·5 per cent. soap, remained free from attack throughout the year, whereas 50 per cent. of the untreated plants in the same beds became infested.

HASSAN (A. S.). **Two injurious Insects new to Egypt (Thysanoptera, and Diptera : Cecidomyidae).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 181–182. Cairo, 1944.

The author states that *Dasyneura* (*Perrisia*) *affinis*, Kieff., which was reared from rolled violet leaves at Giza in 1940, first attacks the young central leaves and later the older ones, and that an infested leaf may contain only one fully grown larva [*cf.* preceding abstract]. Attack continues from July or August until late November, and may affect the flower crop.

Leaves of *Ficus nitida* at Giza were damaged about the year 1940 by an undetermined thrips of the family PHLOEOTHRIPIDAE [possibly *Gynaikothrips ficorum*, Marchal (see next abstract)], which had not previously been found in Egypt, and similar damage was later reported from the Provinces of Sharkia and Qualubiya. The edges of infested leaves curl upwards, touching the surface about the region of the mid-rib, and the tip curves downwards; the rolled leaf contains a considerable number of adults and several hundred eggs. The injury is particularly noticeable in summer, especially on young shoots when the tips of the damaged leaves are reddish-brown. In autumn, the whole leaf assumes a scorched appearance.

MORCOS (G.). *Gynaikothrips ficorum* **Marchal in Egypt (Thysanoptera).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 183–187, 11 figs. Cairo, 1944.

Gynaikothrips (*Phloeothrips*) *ficorum*, Marchal, which had not previously been recorded from Egypt, was found during 1941–43 in the coastal areas round Alexandria and Port Said, the Nile Delta, Upper Egypt as far south as Beni-Suef, and the Fayum. Its distribution in other countries is reviewed, all stages are described, and characters distinguishing it from *G. uzeli*, Zimm., are given. *Ficus nitida* was the only plant attacked in Egypt. Infested leaves curl upwards, forming a shelter in which all stages occur together; as many as 500 individuals were counted on a single leaf. Two Hemiptera and a Chrysopid were predacious on the pupae, but they were too scarce to be of any importance.

HASSAN (A. S.). **Notes on** *Eriophyes mangiferae* **S. N. (Acarina).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 179–180, 1 fig. Cairo, 1944.

Malformed buds were observed on young mango trees in a garden in the Province of Sharkia, Egypt, in 1939 and again in August 1940 when they proved to be infested by *Eriophyes mangiferae*, S. N. [*sic*]. Similar malformations were found on trees in the nursery from which the plants had been supplied and in other parts of the Province. As a result of infestation, the young leaves remain small, and even if damaged buds develop, the internodes produced terminate in malformed buds. After several seasons, the plant becomes stunted, though well tended trees growing in light soil over sandy subsoil may become quite large, so that on them the attack is of little importance. Damage by this mite has become increasingly frequent in recent years, probably as a result of the practice of propagation by budding. The importance of using buds from uninfested trees for this purpose and of destroying infested nursery stock is emphasised. On favourable soil, two applications of an oil spray during the summer, when the mite multiplies rapidly, should be beneficial.

CASSAB (A.). **Les dégâts de la courtilière et leur importance en Egypte (Orthoptera : Gryllotalpidae).**—*Bull. Soc. Fouad Ier Ent.* **28** pp. 195–200, 2 fldg pls., 2 figs. Cairo, 1944.

The cultivation of market-garden crops in Egypt has been increasing in recent years, and this has attracted attention to the losses caused by mole crickets (*Gryllotalpa*), though they also attack field crops of all kinds and sometimes cause a marked decrease in their yield. They are active from March to October, and plants are liable to damage by them for at least three months after sowing. Their prevalence depends partly on the nature of the soil and the fertilisers employed, and market gardens offer favourable conditions for them, since the organic content of the soil is raised by the addition of Nile mud and stable manure, a variety of crops is always present, irrigation is frequent and cultivation shallow. Available evidence indicates that attack is most severe in the vicinity of large towns. The average percentages of plants damaged among market-garden crops in three Provinces during 1935–40 were highest (25·6, 24·2 and 21·6) in beets, carrots and turnips.

Among field crops, potatoes, which are grown on light soils treated with farmyard manure, are most heavily attacked, followed by cucurbits, which are grown on sandy soil treated with pigeon manure. Damage is most severe to potatoes planted in February; the average percentages of tubers attacked in 1935–40 in Upper Egypt, the Nile Delta and Giza were 0·5, 15·6 and 16·8, respectively, for potatoes planted in that month and 0·03, 2·04 and 2·6 for those planted in August–September. In trials of the zinc-phosphide bait [*R.A.E.*, A **25** 96] in an area where 18·4 per cent. of the tubers were attacked, an

application made immediately after the first irrigation, followed by a second 20 days after the second irrigation and a third three weeks later, reduced the percentage to 4·8 and increased the yield by almost 1 ton per acre. Plots that received the first or first two applications only had 7·6 and 5·4 per cent. of the tubers damaged.

Among cucurbits, which are available as food when the mole-crickets emerge from hibernation, watermelons are most heavily attacked, and the damage is most severe immediately after sowing. In three Provinces in 1935–36, the percentage of young shoots attacked on plants of the original sowing varied from 5·3 to 11·4 and on replacements from 0·5 to 1·6. The fruits, which are in contact with the ground, are also damaged, and the annual loss in the three Provinces is estimated at 13–43 per acre.

Observations on injury to cotton in three Provinces in 1935–36 were made because of the great importance of this crop. Seedlings were scarcely attacked, but losses of young plants were 1·8–3·4 per cent. in the original sowings and 0·1–0·8 per cent. among supplementary ones.

HERCE (P.). **Análisis de insecticidas.**—9½ × 6½ ins., 163 pp., 21 figs., refs. Madrid, Inst. nac. Invest. agron., 1945.

Recent legislation in Spain regulating the sale of insecticides and fungicides has increased the demand for chemical analyses of these products, and in this book the author collates information on analytical methods for many substances that are used against insect pests on plants as stomach poisons, contact insecticides or fumigants. The underlying theory of the methods of determination is explained where necessary, as well as the practical details, and where possible the specifications required for insecticidal efficiency are given. Pyrethrum, derris and more recently-developed materials are omitted.

MILLER (D.). **The Grass-grub Problem.**—*N.Z.J. Agric.* **70** no. 1 pp. 51, 53–55, 6 figs. Wellington, N.Z., 1945.

The author gives a short account of the bionomics and control of *Odontria zealandica*, White, which is the most important grass-grub in New Zealand [*cf. R.A.E.*, A **29** 541, etc.]. Methods of preventing damage by the adults include adjusting dates of sowing cruciferous crops [*cf.* **32** 165]; spraying fruit trees and garden shrubs at fortnightly intervals during the period of beetle activity with 1½ lb. each of lead arsenate and slaked lime in 100 gals. water, with the addition of a spreader; and protecting strawberry beds by screening them before dusk with scrim spread on wooden frames, and nurseries by using smudge fires. For these, sulphur is spread thickly on strips of scrim, which are rolled up, placed in pots in and round the nursery and lit before dusk, except during stormy weather; the scrim burns throughout the night, and the fumes effectively repel the beetles. The trapping of beetles by means of light is considered useless, as those attracted are chiefly males.

Though all grasses are subject to damage by the larvae, some, usually those that grow vigorously, are much more resistant than others. Cocksfoot [*Dactylis glomerata*] and crested dogstail [*Cynosurus cristatus*] are resistant, as is clover, but perennial ryegrass [*Lolium perenne*] is susceptible. Grass immediately following cereals is particularly liable to infestation, probably because the females are attracted to soil with a high humus content for oviposition. No method of protecting farm pastures from infestation is known, though the damage caused by the larvae can sometimes be reduced by rolling to consolidate the loosened soil [*cf.* **29** 541] and many pupae can be destroyed by ploughing in September and October [**21** 481]. Lawns can be protected by broadcasting lead arsenate (mixed with soil or sand) at the rate of 5 lb. per 1,000 sq. ft. [*cf.* **22** 41; **29** 542], and larvae at the roots of garden plants can be killed by injecting carbon bisulphide into the soil near them [*cf.* **20** 557].

EVERETT (P.). **Scale Insects and their Control.**—*N.Z.J. Agric.* **70** no. 1 pp. 85–86. Wellington, N.Z., 1945.

A list is given of the six Coccids that are the most injurious on *Citrus* in New Zealand, together with brief accounts of their appearance. They comprise *Aonidiella aurantii*, Mask., *Saissetia oleae*, Bern., *S. coffeae*, Wlk., *Lindingaspis* (*Chrysomphalus*) *rossi*, Mask., *Ceroplastes sinensis*, Del G., and *C. destructor*, Newst. The last has only recently been introduced into New Zealand and is believed to be restricted to a few orchards in one district. These Coccids are best controlled by a spray of summer oil, at a concentration of 2 per cent. against *C. sinensis* and the two species of *Saissetia*, though 1½ per cent. is sometimes effective, and 3 per cent. against the others. Two applications should be made against *Aonidiella*, *Lindingaspis* or *C. destructor*, the first in early February and the second 4–6 weeks later if infestation is severe or *C. destructor* present and at the end of April if infestation is light and *C. destructor* absent. If Bordeaux mixture is being applied against verrucosis, 1½ per cent. summer oil can be added to it against light infestations of *Saissetia* spp., which breed throughout the greater part of the year.

BIRCH (L. C.). **The Effect of Temperature and Dryness on the Survival of the Eggs of** *Calandra oryzae* **L. (small Strain) and** *Rhizopertha dominica* **Fab. (Coleoptera).**—*Aust. J. exp. Biol. med. Sci.* **22** pt. 4 pp. 265–269, 2 figs., 9 refs. Adelaide, 1944.

The following is based on the author's summary of this account of investigations in Adelaide on the effect of temperature and moisture, considered as interacting factors, on the mortality of eggs of *Rhizopertha dominica*, F., and a small strain of *Calandra oryzae*, L. [*cf.* next abstract]. No eggs of *C. oryzae* hatched at a temperature below 13°C. [55·4°F.] or above 34·6°C. [94·28°F.], and none of *R. dominica* above 40°C. [104°F.]. The rate of mortality of eggs at any one temperature was not proportional to saturation deficit or to the product of saturation deficit (s.d.) and duration of incubation (t). The mortality at each temperature was plotted against the evaporating power of the air (s.d. $\times$ t) by the method of probits; for most temperatures, two probit lines were fitted.

There was no simple relation between evaporating power and mortality. When evaporating power was kept constant, mortality increased as the temperature rose, and differences in temperature as small as 2°C. [3·6°F.] gave significant differences in mortality. The relation between temperature (x) and evaporating power (s.d. $\times$ t) when the mortality of eggs of *C. oryzae* was 50 per cent. was given by the parabolic formula, s.d. $\times$ t $= 8{\cdot}9865 - 0{\cdot}414x + 0{\cdot}0057x^2$. For eggs of *R. dominica*, it was given by the linear equation, s.d. $\times$ t $= 19{\cdot}787 - 0{\cdot}391x$.

It was calculated that for a decrease in temperature of 1°C. [1·8°F.], the eggs of *R. dominica* can withstand an increase in evaporating power three times as great as can those of *C. oryzae* for the same mortality, and at any particular temperature the eggs of *R. dominica* can withstand much greater desiccation than those of *C. oryzae*.

BIRCH (L. C.). **Two Strains of** *Calandra oryzae* **L. (Coleoptera).**—*Aust. J. exp. Biol. med. Sci.* **22** pt. 4 pp. 271–275, 2 figs., 7 refs. Adelaide, 1944.

Adults of *Calandra oryzae*, L., reared in Adelaide from individuals taken from stored wheat in South Australia were found to be smaller than others reared in Canberra from individuals from stored maize in Victoria, and interbreeding experiments described in this paper showed that the cultures consisted of two distinct forms of the species [*cf. R.A.E.*, A **33** 361]. Only the smaller strain was found in a preliminary examination of stored wheat in Victoria, South Australia, New South Wales and Western Australia.

The following is substantially the author's summary. The strains differed significantly in the length of the pronotum and the length and maximum width of the body. The large strain developed at a slower rate than the small one at constant temperatures, and the rate of increase in rate of development fell with a rise of temperature between 25·5 and 30°C. [77·9 and 86°F.] for the large strain, but remained constant for the small one. There was no significant difference in the variability in size of the body of the two strains, but the variability in the time required for the development was significantly greater in the large strain. The temperature for maximum oviposition in wheat containing 11 per cent. moisture was lower for the large strain, and fewer eggs were laid by this strain in wheat containing 10 per cent. moisture.

The two strains were inter-sterile. This was not due simply to a physical difference in size, as small individuals of the large strain did not cross with examples of the small strain. Some eggs were laid as a result of mating between the strains, and about 10 per cent. developed to mature embryos, but none hatched.

BIRCH (L. C.). **An improved Method for determining the Influence of Temperature on the Rate of Development of Insect Eggs (using Eggs of the small Strain of *Calandra oryzae* L. (Coleoptera)).**—*Aust. J. exp. Biol. med. Sci.* **22** pt. 4 pp. 277–283, 3 figs., 8 refs. Adelaide, 1944.

The author describes an experimental procedure that gives precise information on the influence of temperature on the time taken for the eggs of the small strain of *Calandra oryzae*, L., to develop. It is based on the hypothesis that the influence of moisture at different temperatures is the same when the eggs lose the same amount of water at these temperatures, that is, when the product of saturation deficit, duration of development and a factor for air movement is constant; the small interaction between temperature and moisture indicated that the procedure was sound. The product of saturation deficit and duration of development (s.d. × t.) can be kept only approximately constant, since the second factor can be determined only approximately until the correct value for the other is known. A first approximation was made by determining the durations of development of the eggs at different temperatures at a constant relative humidity of 75 per cent., and the values obtained were used to calculate approximate values of relative humidity such that the product of saturation deficit in inches of mercury and time in days was constant. The two approxmately constant values 0·96 and 0·56, with a difference in moisture corresponding to the difference between 75 and 85 per cent. relative humidity at 25·4°C. [77·72°F.], were chosen for this product. Analysis of the data on the transformed logarithmic scale showed that development was more rapid at the higher humidity at temperatures between 15·2 and 32·3°C. [59·36 and 90·14°F.], the duration of development decreasing from 442·1 hours at the lowest temperature to 80 at the highest, as compared with a decrease from 443·2 to 83·9 hours for the lower humidity; the duration of development increased again above 32·3°C. Interaction between temperature and moisture was significant when the temperature interval exceeded 9°C. [16·2°F.]. Logistic curves were fitted to the curves obtained by plotting the reciprocal of the development period against temperature, and a means of testing the goodness of fit of these curves is given.

JENKINS (C. F. H.). **The Mediterranean Fruit Fly.**—*J. Dep. Agric. W. Aust.* (2) **21** no. 3 pp. 200–206, 6 figs. Perth, W.A., 1944.

In Western Australia, the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] is an important orchard pest in the region of Perth, occurs sporadically in

certain other districts in the south-west and west, and has been recorded as far north as Carnarvon. Its failure to become generally established is attributed to the vigorous application of control measures and the relatively unfavourable climate in the south, and to the scarcity of suitable host fruits elsewhere. The coldness of the winter in the extreme south-west is not thought to be a limiting factor, in view of the successful establishment of the fly near Paris [*R.A.E.*, A **22** 118]. The egg and larval stages last 2–4 and 14 days, respectively, in summer and up to 20 and 45 days in winter, and the pupal stage lasts 12–50 days. The females oviposit about a week after mating, and the adults do not survive for more than four days without food. A list is given of the numerous host fruits in Western Australia, which include *Citrus*, all the common deciduous fruits and grapes; all are introduced, and the virtual absence of native fruits on which infestations can develop considerably facilitates control.

In a discussion of control measures, bait-traps [**24** 134] are stated to be effective if intensively used, but bait-sprays [**25** 165] also give satisfactory results and are recommended on account of the ease and rapidity with which they are applied. Applications should begin at least six weeks before harvest and continued for two weeks after all the fruit has been gathered. The trees should be maintained at a height such that all the fruit can be gathered from them and they can be conveniently sprayed. Infested fruits should be destroyed by burning or boiling; they should not be buried, as the adults are known to be capable of emerging through a layer of dry sand 4ft. thick.

JENKINS (C. F. H.). **The Vegetable Weevil** (*Listroderes obliquus*, **Klug**).—*J. Dep. Agric. W. Aust.* (2) **21** no. 3 pp. 248–251, 6 figs. Perth, W.A., 1944.

A brief account is given of the bionomics and control of *Listroderes obliquus*, Gylh. [*cf. R.A.E.*, A **30** 156], which has been established in Western Australia for many years, though the date of its introduction is unknown. It is active by night during the autumn, winter and spring. The larvae hatch in 2–4 weeks and feed for several weeks; the pupal stage lasts 2–4 weeks. Most of the adults emerge in early spring. Potatoes, tomatos and root crops are the preferred food-plants, although most vegetables are attacked during the winter; peas, beans and pumpkins are relatively immune. Weeds such as capeweed [*Cryptostemma calendulaceum*] and marsh mallow [*Malva*] are also infested.

Control measures comprise the application of dusts consisting of equal proportions of lead arsenate and slaked lime or of derris or pyrethrum and kaolin, or of a spray of 1 oz. lead arsenate in 2 gals. water. Poison baits consisting of 1 lb. sodium fluoride and 8 lb. chopped fresh carrot, turnip, etc., or 1 lb. Paris green, 25 lb. bran, and 4 lb. molasses mixed with 2½ gals. water are effective against the newly-emerged adults; ½ lb. sodium fluosilicate or sodium arsenite can be substituted for the Paris green or sodium fluoride in these baits.

VENABLES (E. P.). **The Identity of a Borer attacking Peach Trees in the Okanagan Valley of British Columbia.**—*Canad. Ent.* **76** no. 11 p. 232. Guelph, Ont., 1945.

Moths reared in 1940 and 1941 from larvae of an Aegeriid that frequently bores in peach trees in the Okanagan Valley, British Columbia, and has hitherto generally been recorded as *Aegeria* (*Sanninoidea*) *exitiosa*, Say, were found to be *A.* (*S.*) *graefi*, Edw. Characters are given distinguishing the adults of the two species.

BAILEY (S. F.). **The Pear Thrips in California.**—*Bull. Calif. agric. Exp. Sta.* no. 687, 55 pp., 32 figs., 68 refs. Berkeley, Calif., 1944.

The following is based on the author's summary of this paper, which includes the results of 11 years' investigations. *Taeniothrips inconsequens*, Uzel, was introduced into California, probably from central Europe, about 1900 or possibly earlier, and has now reached its limit of spread in that State, though it is extending its restricted range in other parts of the United States and Canada in areas in which deciduous fruits are grown. It has been found on numerous native plants, but is most abundant and injurious on pear, prune, plum and cherry. Within its range in north-central California, the degree of injury varies with the district and year; in outbreak years, many orchards lose nearly all their crop, and the thrips is a major pest on pear and prune in four counties. Injury to the buds by the adults directly reduces the crop, and the scarring of fruit by the nymphs seriously lowers its quality.

Only females have been found in California, and there is only one generation in the year. As the buds swell, the adults emerge from hibernation in their pupal cells in the soil and begin to feed and to deposit their eggs in the stems, leaves and fruit [*cf. R.A.E.*, A **23** 22]. The nymphs hatch by petal-fall and become full-fed in about two weeks, when they drop to the ground and make a cell at a depth of 6–12 inches, in which they pupate, completing the prepupal and pupal instars in autumn. The population and injury are much greater in dry years than in wet ones; the amount of rainfall in April–May and September–October rather than the annual total is probably the most important factor causing the numbers of the thrips to fluctuate. It has no important natural enemies.

The growing of heavy cover crops retards spring emergence for only a few days and has little value in outbreak years. Autumn ploughing, with a single plough to a depth of 12 inches one way, reduces the population to some extent in dry years, but the practice has more disadvantages than advantages. Irrigation in October, while the thrips is in the pupal instar, using contours or basins and applying six or more acre-inches of water, gives a good kill [*cf. loc. cit.*]. In tests of proprietary materials carried out in 1933–42, bait-sprays of 2–4 lb. each of tartar emetic and sugar per 100 U.S. gals. water and rotenone sprays gave the best results. Rotenone spray powders (especially those to which pyrethrum has been added) should be used at the rate of 2–6 lb. per 100 U.S. gals. water, according to rotenone content. Products containing less than 0·75 per cent. rotenone are not practical in sprays or in dusts, of which not less than 35 lb. should be applied per acre. In general, sprays were more effective than dusts, and all sprays and dusts were much more effective in reducing fruit injury and subsequent bud injury if directed against nymphs rather than adults.

MCGREGOR (E. A.). **The Citrus Thrips, Measures for its Control, and their Effect on other Citrus Pests.**—*Circ. U.S. Dep. Agric.* no. 708, 12 pp., 7 figs., 17 refs. Washington, D.C., 1944.

An account is given of the life-history and control of *Scirtothrips citri*, Moult., which is prevalent in most of the *Citrus*-growing regions in California and Arizona and causes serious losses every year [*cf. R.A.E.*, A **27** 432]. Navel oranges and lemons are chiefly attacked in California and navel oranges and grapefruit in Arizona. There are probably 10–12 overlapping generations in the year in the hotter localities. The thrips feeds chiefly on *Citrus*, and though it occurs occasionally on many other plants, *Schinus molle* is the only one of them on which it is known to overwinter in the egg stage. It is attacked by several predacious insects and spiders, but they exert little control.

Most of the damage on orange is caused by the second generation, which attacks the fruits in May and early June, while they are quite small, and control

can usually be obtained by a single spray containing lime-sulphur or equal parts of tartar emetic and sugar, applied when most of the petals have fallen, or by three applications of sulphur dust in March–June [*cf.* **31** 58, etc.]. The tartar emetic is applied at the rate of 1½ lb. in 20–50 U.S. gals. water per acre with a spray duster or 2 lb. in 100–200 U.S. gals. with broom guns or boom sprayers [*cf.* **31** 58]. Except where resistance to it has developed [*cf.* **33** 97, etc.], it is as effective as sulphur dust and rather cheaper, and, unlike sulphur dust, it has caused no important injury to *Citrus* fruit or foliage. It is, however, ineffective against some other pests that are controlled by sulphur. Injury to lemon, on which fruits form throughout the summer, is greatest from June to mid-October, and is very slight before June in southern California. Sprays containing double the concentrations of tartar emetic and sugar used on oranges should be applied in the same quantities of water per acre two or three times when the thrips is becoming numerous enough to damage the tender leaves and fruit, or the trees should be dusted 4–5 times with sulphur at intervals of four weeks from about 25th May [*cf.* **27** 433]. Other spray formulae have proved effective in preliminary tests [*cf.* **31** 209 ; **32** 219, 368].

Coccus pseudomagnoliarum, Kuw., is also present on *Citrus* in some areas, and as the crawlers, which usually hatch between 1st May and 10th July, are the stage most easily killed, the foliage should be kept coated with sulphur dust during this period, and an additional dusting 2–3 weeks after the third application against the thrips is sometimes desirable. If the Coccid is abundant, the orchard should be properly sprayed or fumigated ; it may then be kept in satisfactory condition for several years by the regular sulphur-dusting programme. This scale may also be controlled with the regular lime-sulphur spray used against the thrips. If *Saissetia oleae*, Bern., is present, dusting should begin when hatching is first observed and continue at intervals of 3–4 weeks until at least two-thirds of the crawlers have hatched. Sulphur dusts applied against the thrips and Coccids have often caused marked reductions in the populations of *Paratetranychus citri*, McG., on *Citrus*.

Graves (H. W.). **The Mormon Cricket in California.**—*Bull. Dep. Agric. Calif.* **32** no. 3 pp. 201–205, 1 fig. Sacramento, Calif., 1943.

Outbreaks of *Anabrus simplex*, Hald., occurred in north-eastern California in 1941 and 1942 over a small area of mountain pasture in the Sierra Nevada mountains, extending into two counties [*R.A.E.*, A **30** 602 ; **32** 114]. Records of the occurrence of this Tettigoniid in California since 1864 are reviewed. In 1941, the outbreak occurred at an altitude of about 6,000 ft. on a mountain side above a lake ; the vegetation in the infested area is described. In August, an area of 480 acres was found to be infested ; only adults were present and oviposition was in progress, little or no selectivity being shown with regard to site. In September, the numbers of eggs averaged 26 per square foot, but reached 200 in one case. In 1942, adults were fairly numerous in the same area in June and were migrating by early July. Some vegetable gardens near the lake were partly destroyed, but cereals and hay in fields along the shore were only slightly damaged. Preferred food-plants were *Wyethia mollis*, *Agastache uricifolia*, and *Lupinus* spp., and, where infestation was heavy, various grasses. Damage to forage plants was insufficient to affect the cattle, as the range was not stocked to capacity. The altitude of the infested area was about 4,000–7,000 ft., and the number of eggs present in September averaged 11·4 per square foot. In July, about 2¼ tons of a bait of bran, oil and sodium fluosilicate was distributed and as a result the main groups were destroyed. It is concluded that this district is not generally favourable for outbreaks, but that conditions may sometimes permit them. Scattered light infestations and migrations are likely to occur on the eastern slopes of the range and may at times extend into similar areas on the western slopes.

STAFFORD (E. M.) & STEINWEDEN (J. B.): **A Report on the Fumigation of Olive Scale,** *Parlatoria oleae* **with Hydrocyanic Acid.**—*Bull. Dep. Agric. Calif.* **32** no. 3 pp. 206–208, 1 fig. Sacramento, Calif., 1943. **A Report on the Fumigation of Olive Scale,** *Parlatoria oleae* **with Methyl Bromide.**—*T.c.* pp. 209–211, 1 fig.

It is stated in the first paper that since restrictions have been placed on the movement of nursery stock in certain areas in California, owing to the discovery of *Parlatoria oleae*, Colv., in the San Joaquin Valley, the control of this Coccid on nursery stock by fumigation was investigated [*cf. R.A.E.*, A **32** 113]. A summary is also given of the seasonal history of the Coccid, based on two years' observations. There were two generations a year. Oviposition began in late March, and first- and second-instar nymphs and adults of the first generation were most abundant in May, June and July, and first- and second-instar nymphs of the second generation in August and September, respectively. The proportion of adult females increased after October, and they comprised the bulk of the overwintering population. The experiments on fumigation with hydrocyanic acid gas were made in September 1942, when over 80 per cent. of the Coccids were immature and the temperature in the fumigation chamber varied from 76 to 87°F., and early in February 1943, when no eggs or first-instar nymphs were present, only about 20 per cent. of the Coccids were immature, and the temperature in the chamber was 51°F. Fumigation was carried out on infested olive seedlings; liquid hydrocyanic acid was used at dosages of 0·52–18 cc. per 100 cu. ft. for an exposure period of 50 minutes, and counts were made a month later. Dosages of 9 cc. or more gave complete mortality at both temperatures, and those of 4·5 cc. or less did not do so at either. In general, each dosage gave approximately the same total mortality at both temperatures, and the fact that mortality at the higher one was as high is attributed to the presence at the time of a large proportion of first-instar nymphs, which were found to be the most susceptible stage. The eggs were also very susceptible, and the young adult females and nymphs undergoing the second moult were the most resistant. When the second-instar nymphs and the adult females were considered separately, mortality from the lower dosages was lower at the high temperature, except in the case of adult females exposed to the lowest of all.

Similar experiments carried out at the same time with methyl bromide are described in the second paper. Infested rose bushes were used as well as olive seedlings, the dosages ranged from ½ to 4 lb. per 1,000 cu. ft., and the exposure period was two hours. The temperature of the fumigation chamber varied from 70 to 89°F. in September and from 51 to 72°F. in February. Complete mortality was given at 80°F. by a minimum dosage of 1½ lb., while dosages of 1 lb. at 52° and 2 lb. at 51–53°F. gave mortalities of only 17·5 and 79·8 per cent., respectively. Complete mortality, however, was given by dosages of 2 lb. at 70°, 3 lb. at 63° and 3·5 lb. at 51°F., and it is suggested that methyl bromide can therefore be used at temperatures lower than those commonly employed. No definite conclusion could be drawn regarding the relative susceptibility of the different stages, but the eggs were very susceptible.

Entomology and economic Zoology.—*54th Rep. Ariz. agric. Exp. Sta. 1942–43* pp. 51–53. Tucson, Ariz., 1944.

The Dynastid, *Ligyrus gibbosus*, Deg., girdled the roots of guayule (*Parthenium argentatum*) in Arizona in 1942 and killed many plants, the damage beginning in June and continuing throughout the summer. It was less injurious in 1943, but it is not known whether infestation was lower or whether the resistance of the plants had increased with age.

Continued observations on *Myzocallis* (*Monellia*) *costalis*, Fitch [*cf. R.A.E.*, A **32** 256], which occurs on pecan in four areas of southern Arizona, indicated that feeding by this Aphid may continue from May until December in the Tucson district when winter conditions are favourable. *Melanocallis caryaefoliae*, Davis, was recorded in Arizona for the first time in September 1942, when it was found to be well established on pecan at three neighbouring places in the south-east.

In the same year, beans, soy-beans, *Zinnia* and *Sophora japonica* were damaged by a Hispid closely resembling *Chalepus scapularis*, Ol., at three places in southern Arizona.

FURNISS (R. L.). **Carpenter Ant Control in Oregon.**—*Circ. Ore. agric. Exp. Sta.* no. 158, 12 pp., 3 figs., 2 refs. Corvallis, Ore., 1944.

Carpenter ants are serious pests in houses in Oregon, particularly west of the Cascade Mountains, where they appear to be the commonest wood-boring insects in them. The three species concerned are *Camponotus herculeanus modoc*, Wheeler, *C. laevigatus*, F. Sm., and *C. maculatus vicinus*, Mayr. Investigations carried out for several years showed that no one control measure is effective under all conditions; the author describes the principal ones and indicates how and under what conditions each should be applied. The ants are a nuisance in houses, getting into food and swarming in the living rooms, and also cause material damage by mining in building timbers; if allowed to establish a large colony they may do structural damage extensive enough to require major repairs. They do not feed on wood, but mine into it to provide living quarters. The colonies become established in new situations through invasion by a fertile queen or, more commonly, through immigration of all or part of an existing colony, particularly when there are trees or stumps near the house. The ants show some preference for moist rotting timbers about the foundations, but readily mine sound dry wood in any part of a house. They also attack telegraph poles, crates and living trees, and cause an increase in infestations of Aphids by tending them for honeydew.

A tightly constructed house with concrete foundations, good clearance and, preferably, a full basement, provides conditions least favourable for the establishment of the ants and most favourable for control measures, and the elimination of waste wood in the vicinity and of infested firewood and the destruction of colonies in hollow trees within a radius of several hundred feet help to prevent the immigration of a colony. When one has become established, the control measure depends on its situation. Neither baits nor materials applied by injection to act both as contact insecticides and as fumigants have proved effective in the Pacific Northwest, though orthodichlorbenzene or a mixture of equal parts of coal-tar creosote and petrol [*cf. R.A.E.*, A **26** 219] can sometimes be used. Fumigation with hydrocyanic acid is effective if the colonies are in floors or inner walls but not if they are in large timbers, as the gas does not penetrate adequately. When infested wood is fairly accessible, an effective method is to open the colony and kill the exposed ants by applying a contact insecticide with a hand sprayer; treatment should be immediate and thorough, so that none of the ants escapes. The grooming habits of ants make it possible to control them with dusts that act as stomach poisons; these should be applied directly to as many ants as possible and also to places where many others will pass through them. Dry sodium fluoride is generally effective; it should be introduced into the ant chambers in liberal quantities through holes bored into the timber. If this is impracticable, dusting the principal runways often gives good results, and dusting within walls and under floors where the ants are active is strongly recommended. Several applications may be necessary; 1–2 lb. per application is enough for a medium-sized colony. A dents or cube

dust containing 4 per cent. rotenone applied in the same way [*cf.* **28** 485] is at least equally effective, and there is evidence that dust of a lower rotenone content would also give satisfactory results. Both sodium fluoride and derris have been used successfully against colonies in ornamental trees without harm to the latter ; such applications should be made in summer when the infested wood is relatively dry, the ants are active and the action of the insecticides is most rapid.

WALKDEN (H. H.), HORTON (J. R.) & WADLEY (F. M.). **Hessian Fly Control in Nebraska by late Sowing of Winter Wheat.**—*Bull. Neb. agric. Exp. Sta.* no. 360, 11 pp., 6 figs., 2 refs. Lincoln, Neb., 1944.

Delayed sowing, supplemented by the ploughing under of stubble and cultivation to eliminate self-sown plants, has for many years been recommended for the control of the Hessian fly [*Mayetiola destructor*, Say] on winter wheat in Nebraska and is likely to be of continued importance, despite the promising results obtained with resistant varieties. Late-sown wheat is liable to injury by cold, however, as the winters are severe. The effect on infestation and yield of sowing on five different dates between 15th September and 15th October was examined at four places in eastern Nebraska between 1923 and 1935 in an attempt to determine the date most suitable for local conditions. The data obtained, including the earliest dates on which wheat that remained free from infestation or in which infestation did not exceed 10 per cent. was sown at each place in the different years, are given in tables. They show that infestation in this area is likely to be considerable in one year out of three and to cause severe damage in one out of ten. By a delay in sowing until about 1st October, autumn infestation was avoided in most years, including about two of every three in which it was severe in earlier-sown wheat, and the average yield over an 11-year period was more satisfactory than that from earlier crops ; there was a marked reduction in yield from wheat sown later than 1st October in 1927. Despite the increased risk of loss due to cold and the disadvantage of ignoring favourable sowing conditions that may occur earlier in the season, sowing about 1st October is considered to be a fairly satisfactory method of preventing loss due to the fly and to be of value in years in which it is abundant ; if it is scarce, earlier sowing dates may be used. In tests in 1923–24 at a place considerably farther west, where infestation is less common but occasionally severe, crops sown on 29th September did not become infested and gave appreciably higher yields than those sown more than three days earlier or later.

HILL (R. E.) & TATE (H. D.). **Potato Flea Beetle Control in western Nebraska.**—*Bull. Neb. agric. Exp. Sta.* no. 361, 23 pp., 7 figs., 1 ref. Lincoln, Neb., 1944.

Damage to potatoes by flea-beetles has resulted in extensive losses in western Nebraska, notably in irrigated areas of the North Platte Valley, and has also occurred in non-irrigated districts and in irrigated fields in central Nebraska. The species present are *Epitrix tuberis*, Gentner (*cucumeris*, auct.) [*R.A.E.*, A **33** 220], which is the most important, *Systena blanda*, Melsh., which is sometimes numerous in early summer, and *E. hirtipennis*, Melsh., which causes little injury to potato. An account is given of observations on the bionomics of *E. tuberis*, some of which have already been noticed [**31** 337], and on its control.

Observations in 1943 on potatoes planted on 22nd May and 3rd and 24th June showed that the numbers of this flea-beetle, foliage injury, and losses due to feeding by the larvae on the tubers were all greatest in the earliest and least in the latest crops, and investigations in 1940, 1941 and 1942 showed

that populations of adults and tuber injury by larvae on late potatoes were much greater if they were near early ones than if they were not. The course of infestation from May to September on early, mid-season and late crops based on collections made over a period of four years is shown in a graph. Overwintered adults were most numerous about the middle of June, first-generation adults in late July on early and mid-season crops and second generation adults at the end of August on the latter. Evidence that first-generation adults develop from heaps of unmarketable potatoes on which overwintered beetles have oviposited was obtained in 1942, when 722 emerged from a portion of such a heap 20 ins. square and about 7 ins. deep. In the following year, large numbers of overwintered adults were observed congregating on the sprouting tubers on the heaps in late May and June.

The results of experiments on control in 1940–43 are given in detail. They showed that dusts were as effective as sprays, the application of which present a number of disadvantages. Dusts should be applied when there is little wind, but the presence or absence of dew had little effect. The most effective of the sprays tested were zinc arsenite and basic copper arsenate (which was used only in 1940), both applied at a concentration of 5 lb. in 100 U.S. gals. In tests in 1942, zinc arsenite gave approximately equal control at concentrations of 2½ and 5 lb. Cryolite and Dutox (72 per cent. barium fluosilicate and 8 per cent. sodium fluoaluminate) were among the less effective insecticides in sprays, but dust mixtures containing 20 per cent. of either were approximately as good as sprays of zinc arsenite and superior to dusts of zinc arsenite or 0·5 per cent. rotenone. The use of dusting sulphur, of which at least 93 per cent. will pass through a 325-mesh screen, instead of an inert carrier for both Dutox and cryolite is recommended against the potato Psyllid [*Paratrioza cockerelli*, Šulc] ; similarly, liquid lime-sulphur or wettable sulphur should be incorporated in sprays at concentrations of 2½ U.S. gals. and 10 lb. per 100 U.S. gals., respectively. The effectiveness of a dust mixture of sulphur and cryolite was slightly increased by the addition of 0·5 per cent. rotenone in a single test in 1943. Dusts should be applied at rates of 30–35 lb. and sprays at 100–125 U.S. gals. per acre. Treatment should be begun early, and three to five applications made at intervals of 7–10 days.

Other recommendations are to delay planting until 15th June, except at high altitudes, to avoid situations near early crops, and to burn unmarketable tubers or sprinkle the surface of the heaps with salt or waste lubricating oil.

It is stated in an appendix that a dust containing 3 per cent. DDT and a spray containing 4 lb. of 10 per cent. DDT in 100 U.S. gals. water gave good control in field experiments in western Nebraska in 1944.

MUNRO (J. A.). **Will delayed Seeding reduce Damage caused by the Sweet Clover Weevil ?**—*Bi-m. Bull. N. Dak. agric. Exp. Sta.* **7** no. 2 pp. 13–14. Fargo, N. Dak., 1944.

The sweet-clover weevil [*Sitona cylindricollis*, Fhs.] has recently become widely distributed in North Dakota [*cf. R.A.E.*, A **31** 205 ; **32** 32] and causes serious damage to young seedlings of sweet clover [*Melilotus*] in early spring, when there is little foliage available and the overwintered weevils are most numerous and most active in search of food and oviposition sites. They disperse by flight, particularly during the last week of April and early May at Fargo, and deposit their eggs at the base of the plants, chiefly during late May and early June. In the laboratory, one weevil laid 19 eggs in 24 hours, and these hatched in 14 days. The larvae feed on the rootlets and nodules of the plants for a few weeks, but the damage they cause is unimportant compared with that due to adults feeding on the leaves. The pupal stage is short, and the adults emerge between the last week of July and mid-August.

In tests with two annual and 13 biennial varieties of sweet clover, plots sown on 22nd May produced less than 5 per cent. of a normal stand of plants, whereas the same varieties sown on 18th June produced 90 per cent. of a normal stand and examination on 15th July showed an average of five larvae per plant in the May sowing and of one per 30 plants in the June one. Although the poor survival of the earlier plants may have been due partly to wet weather and other factors, the weevil was largely responsible. These results were confirmed in a field near Fargo in 1944, part of which was sown 2–3 weeks later than the rest; the earlier portion showed a complete failure of sweet clover, whereas the other produced 35–40 per cent. of a normal stand.

MUNRO (J. A.), TELFORD (H. S.), REDMAN (K.) & STOA (T. E.). **Biology and Control of the Sweet Clover Weevil.**—*Bi-m. Bull. N. Dak. agric. Exp. Sta.* **7** no. 2 pp. 31–34. Fargo, N. Dak., 1944.

The authors give the results of two years' observations in North Dakota on 13 biennial varieties of sweet clover [*Melilotus*], showing that there are considerable differences in susceptibility to attack by adults of *Sitona cylindricollis*, Fhs. [*cf. R.A.E.*, A **32** 32]. Dusting sweet clover with barium fluosilicate on 24th May gave about 40 per cent. control as indicated by the number of weevils caught with a net on 6th June, but caused no significant reduction in feeding injury by that date, apparently because the main damage had been done before treatment. The application at a rate of 20 lb. per acre of a bait of sodium fluosilicate and bran (5 : 95), moistened with water and unflavoured or flavoured with 0·01 per cent. coumarin on 15th June gave no significant control. Burning over clover fields in autumn caused no significant difference in the amount of weevil damage, probably owing to migration from untreated fields.

Notes are given on the bionomics of the weevil [*cf.* preceding abstract]. The number of overwintered adults appeared to change little from late April until the beginning of June, after which it decreased until by mid-July it was difficult to find any. Newly emerged weevils were much less injurious than overwintered ones, since the plants are not so easy to defoliate in late summer. From late September until November they were found in large numbers beneath beehives and shocks of sweet clover, and to some extent among the plants, preparing for hibernation, which normally takes place in such situations.

LANGE jr. (W. H.). *Autographa egena* **(Guen.) a periodic Pest of Beans in California.**—*Pan-Pacif. Ent.* **21** no. 1 p. 13. San Francisco, Calif., 1945.

Larvae of *Autographa egena*, Gn., were observed in western California in October 1943 feeding on the leaves, green pods and seeds of beans, especially climbing varieties; in some cases the plants were almost completely defoliated. The larvae pupated in November in silken cocoons constructed in rolled leaves, and adults emerged in December and again in May 1944. Several generations develop each year. Larvae collected in August 1943 were parasitised by an Encyrtid, probably *Litomastix* (*Copidosoma*) *truncatella*, Dalm., and by *Amblyteles montanus*, Cress., *Pimpla* (*Ephialtes*) *sanguinipes*, Cress., and *Chaetogaedia monticola*, Big., the percentages of parasitism being 14, 1, 1 and 3, respectively. A fungus destroyed 2 per cent. of the larvae, and a further 2 per cent. failed to complete their development for unknown reasons. Damage to beans by *A. egena* had previously been recorded in the coast of California in July 1936.

TILDEN (J. W.). **Notes on Redwood Cerambycids (Coleoptera).**—*Pan-Pacif. Ent.* **21** no. 1 pp. 30–31. San Francisco, Calif., 1945.

Adults of *Semanotus ligneus sequoiae*, Van Dyke, and *Callidium pallidum*, Van Dyke, were reared from coast redwood [*Sequoia sempervirens*] in

California during the winter of 1932–33, together with one of *Opsimus quadrilineatus*, Mannh., which has hitherto been associated only with *Pseudotsuga taxifolia*. An attempt was made in the following winter to rear these Cerambycids from naturally-infested second-growth redwood stored indoors, but mortality during emergence was high, possibly owing to the unnaturally dry conditions. In the autumn of 1935, a second-growth tree with a trunk about 10 ins. in diameter that had been felled in March and left exposed in the woods during the summer was found to be heavily infested with Cerambycid larvae, and in March 1936 the adults, which were about to emerge from the tree, were removed. More than 70 adults of *S. l. sequoiae* were obtained from the main trunk, 150 of *C. pallidum* from the large branches and the part of the trunk from which they arose, and a number of *Phymatodes nitidus*, Lec., and a few of *C. sempervirens*, Linsley, from the small branches and twigs at the top of the tree. Larvae of the Trogositid, *Temnochila virescens*, F., and a single Raphidiid larva were found in the galleries of *S. l. sequoiae*, and some of the pupae were destroyed by an unidentified fungus. Adults of the Cerambycids were taken in nature in the same locality from late February until mid-April. It is concluded that these beetles are commoner than was supposed and can build up large populations when freshly-cut trees are available during the oviposition period. The larvae feed first in the drying cambium and then in the sapwood, and may ultimately penetrate still deeper. Pupation takes place immediately below the bark.

GLASS (E. H.). **Feeding Habits of two Mealybugs, *Pseudococcus comstocki* (Kuw.) and *Phenacoccus colemani* (Ehrh.).**—*Tech. Bull. Virginia agric. Exp. Sta.* no. 95, 16 pp., 16 figs., 7 refs. Blacksburg, Va., 1944.

The following is based chiefly on the author's summary. Studies were made in Virginia in 1941–43 on the feeding habits of *Pseudococcus comstocki*, Kuw., on the leaves and wood of apple, to which it causes serious injury [*R.A.E.*, A **29** 195; **30** 128], sprouts of potato, and stems of sweet potato, and of the greenhouse mealybug, *Phenacoccus colemani*, Ehrh., on the petioles of geranium and leaves of sweet potato and calla lily [*Zantedeschia*]. The feeding habits of the two species were found to be similar. In most cases, the path of the stylets through the plant tissue was intracellular, and the phloem appeared to be the principal source of food. Sometimes the stylets probed in several directions, without being withdrawn, in order to locate suitable tissue. As in other insects [**20** 404], the stylets were found to be enclosed in a sheath, which remains in the plant tissue when they are withdrawn. Plant cells were observed to have collapsed in only one feeding puncture, and it is concluded that the damage to the plants is due to withdrawal of food by the mealybugs rather than injury to the cells, though it is possible that the conducting tissues may become blocked by the sheaths.

University of Puerto Rico Agricultural Experiment Station. Annual Report for the Fiscal Year 1942–43.—59 pp. Río Piedras, P.R., 1944.

Factors to be considered in using *Trichogramma minutum*, Ril., for the biological control of *Diatraea saccharalis*, F., on sugar-cane in Puerto Rico [*R.A.E.*, A **32** 53] are briefly discussed. The mole-cricket [*Scapteriscus vicinus*, Scud.] prevents the cultivation of vegetables in some parts of the Island, though, even in these areas, it was found to be scarce in the higher, drier, and less fertile situations. It prefers loose soil but is sometimes abundant enough to be very injurious in compact clay in low, moist sites. In such

land, where leaves of mamey [*Mammea americana*] [*cf.* **21** 519] are not available, plants were successfully protected from it by sinking cans from which the tops and bottoms have been removed into the soil round them to a depth of about 1½ ins. Its introduced parasite, *Larra americana*, Sauss. [*cf.* **31** 55, etc.], was spreading at one liberation point.

HUNT (G. M.) & SNYDER (T. E.). **An international Termite Exposure Test—Fifteenth Progress Report.**—[*Proc.*] *Amer. Wood Pres. Ass.* [**40**] preprint 16 pp. [Baltimore, Md.] 1944.

In this progress report on the effectiveness of various chemicals in preserving specimens of wood from attack by decay and termites [*cf. R.A.E.*, A **32** 61], data are tabulated on the condition in 1943 of the specimens installed in 1928, 1931, 1933, 1938, 1940 and 1941. It is still considered that the tests must be continued for many years before the results can safely be applied for the selection of preservatives to use on a commercial scale.

FLETCHER (F. W.). **Ortho-dichlorobenzene as an Insecticide.**—*Pests* **13** no. 3 pp. 15–16, 18, 20, 22, 24, 26, 28, 170 refs. Kansas City, Mo., 1945.

The author gives details of the physical, chemical and toxicological properties of orthodichlorbenzene, a short historical review of its use as an insecticide and a table summarising data from the extensive literature on its effect on injurious insects. This is divided into sections dealing with the main groups of pests, and in each are given the names of the insects concerned, notes on the methods of application and the results obtained, and references to the sources of the information.

PAILLOT (A.). *Mesnilia legeri* **nov. gen. nov. sp., parasite de la cochylis de la vigne** (*Clysia ambiguella* **Hbn.**).—*C.R. Soc. Biol.* **135** no. 13–14 pp. 1041–1043. Paris, 1941.

A microsporidian disease was found to be fairly widespread among larvae of the vine moth, *Clysiana* (*Clysia*) *ambiguella*, Hb., near Saint-Genis-Laval (Rhône) in August 1940. The microsporidian is described as *Mesnilia legeri*, gen. et sp. n., and some unusual features of its life history are recorded. It is estimated that 6–8 per cent. of the larvae were attacked. Only the nerve and blood cells and those of the absorptive region of the hind gut are refractory to the infection. The sexual cells are partly destroyed. The presence of the parasites in the cells does not seem to cause characteristic lesions apart from vacuolation of the cytoplasm.

PAPERS NOTICED BY TITLE ONLY.

COATON (W. G. H.). **The Harvester Termite.** [Biology and Control of *Hodotermes* in South Africa.]—*Fmg in S. Afr.* 1943 repr. no. 43, 5 pp., 4 figs. Pretoria, 1943. [*Cf. R.A.E.*, A **23** 675, etc.]

BOCZKOWSKA [M.] & CHARROT (—). **Remarques sur l'écologie du doryphore** [*Leptinotarsa decemlineata*, Say, on potato] **à Saint-Genis-Laval (Rhône) en 1942.**—*C.R. Acad. Agric. Fr.* **30** repr. 4 pp. Paris, 1944. [*Cf. R.A.E.*, A **33** 298.]

IMPERIAL INSTITUTE. **Quarterly Bibliography of Insecticide Materials of Vegetable Origin, No. 29 (October-December 1944).**—*Bull. imp. Inst.* **43** no. 1 pp. 29–34. London, 1945. [*Cf. R.A.E.*, A **33** 192.]